THE APPLICATION OF SOFT SYSTEMS METHODOLOGY FOR IMPROVING THE AGROTECHNOLOGY TRANSFER PROCESS RESPONDING TO TREE CROP FARMING CONCERNS IN KONA, HAWAII

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN AGRONOMY AND SOIL SCIENCE

August, 1989

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ACKNOWLEDGMENTS

The analyst is grateful to the administration of the University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources (UHMCTAHR) for supporting her dissertation involving agrotechnology transfer in Hawaii. She is especially grateful to Dr. Tadashi Higaki and Jean Gutierres for assisting in identifying a site for the dissertation research. The analyst is grateful to her graduate committee for their flexibility in allowing her to undertake such a new approach for examining agrotechnology transfer as a topic within the field of agronomy and soil science. She especially thanks her committee chair, Dr. Peter Rotar, for reviewing several dissertation drafts. The analyst can not adequately express her gratitude to Dr. Kathleen Wilson, without whom this dissertation would not have been possible. Dr. Wilson's high academic standards, commitment to working for improvement, and patient style in approaching sensitive issues have served as a model for the analyst to grow and mature during the time of her graduate studies. She is also grateful to Dr. Samir El-Swaify, Chairman of the Department of Agronomy and Soil Science at UHMCTAHR, for his interest and support. The analyst is also indebted to Dr. K.

N. Satyapal of the United Nations Development Program for urging her to pursue her doctoral studies and Dr. M.S. Swaminathan, former Director General of the International Rice Research Institute, for support and encouragement.

The analyst also expresses her heartfelt gratitude to Kona's farmers and community members. The analyst considers herself fortunate to have selected Kona as her study area because of the forthright and kind nature of the area's people. Their involvement proved crucial to the success of the dissertation research because without farmers, there is no meaning for agricultural research, extension and education. She wishes to express her special thanks to Chiko Asuncion, Janet Coburn, Tom Bong, Sally Rice, and Howard Simon who contributed countless hours of their valuable time to the study. She is also grateful for the opportunity to have worked with Norman Bezona in envisioning and developing real-world, agrotechnology transfer improvements. Lastly, the analyst would also like to thank John Packo for his time developing dissertation illustrations and his never ending patience, optimism and support as a loving husband.

ABSTRACT

This dissertation applied soft systems methodology for improving the agrotechnology transfer process responding to tree crop farming concerns in Kona, Hawaii. The ten-month study undertook on-site research activities involving randomly selected Kona farmers, leaders of commodity organizations and university staff. The analyst engaged participants in the methodology's seven-stage process. They 1) described non-commodity specific and coffee, macadamia nut and avocado concerns, 2) envisioned improvements, 3) developed models of improved situations, 4) compared these models with the actual situation, 5) debated feasible and desirable changes and 6) implemented agreed-upon changes. Major conclusions of the study were that: 1) soft systems methodology caused change in agrotechnology transfer because it accounted for multiple worldviews affecting the process, 2) the current agrotechnology transfer structure, the Industry Analysis Program, had shortcomings, 3) participants requested soft systems methodology for improving the agrotechnology transfer process and on-farm research activities in Kona for assisting small-scale farmers, and 4) the analyst was a catalyst that assisted community members in bringing changes to the agrotechnology transfer process.

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LIST OF ABBREVIATIONS

DOA	Hawaii State Department of Agriculture
KCC	Kona Coffee Council
KFB	Kona Chapter, Hawaii State Farm Bureau
KFC	Kona Farmers Cooperative
GACC	Governor's Agricultural Coordinating Committee
HAA	Hawaii Avocado Association
HMNA	Hawaii Macadamia Nut Association
IAP	Industry Analysis Program
PCC	Pacific Coffee Cooperative
UH	University of Hawaii System
UHHCA	University of Hawaii at Hilo, College of Agriculture
UHMCTAHR	University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources
UHMHITAHR	University of Hawaii at Manoa, Hawaii Institute of Tropical Agriculture and Human Resources
UHH	University of Hawaii at Hilo
UHM	University of Hawaii at Manoa

EXECUTIVE SUMMARY

Many real-world agricultural problems can not be reduced to quantifiable factors for controlled laboratory research and/or field experiments. They involve management of activities undertaken by people in complex situations. This dissertation employed a relatively new methodology, soft systems, for improving the agrotechnology transfer process responding to tree crop farming concerns in Kona, Hawaii. Agrotechnology transfer was examined as a complex, holistic process that designs, develops, disseminates, and uses agrotechnologies and information. The ten-month study did not examine dissemination of agricultural innovations nor undertake commodity-specific research, rather it designed improved systems addressing farming concerns. Participants included 1) forty-four randomly selected farmers and 2) twenty-four leaders of commodity organizations and University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources (UHMCTAHR) staff responsible for transferring agrotechnologies and information to some fifteen hundred coffee, macadamia nut and avocado farmers in Kona.

The analyst reviewed background information and UHMCTAHR research projects to understand the context of the situation. She learned that

the UHMCTAHR structure, the Industry Analysis Program (IAP), has been the means by which agricultural information and technology are transferred in Hawaii since the 1970's. Although not the main thrust of the study, the analyst had the opportunity for comparing soft systems methodology with the IAP. Making this comparison revealed IAP shortcomings.

Soft systems methodology was developed for improving concerns in closed, single business situations where all parties are known and the problem situation was easily defined. Soft systems methodology is an inquiry process developed for improving complex problematic situations with multiple worldviews regarding concerns and potential improvements. Future soft systems applications are needed for identifying possible improvements to its process and techniques and for modifying it to meet specific requirements dictated by each situation to which is applied. This was the first time it was applied in the field of agronomy and soil science and involved the multilocational, multiinstitutional situation affecting agrotechnology transfer in Hawaii. Farming in Kona is influenced by federal, state and local policies and "rules of the game" which aren't well-understood. All people influencing the situation were not known and some either were not willing or not available to be part of the inquiry process.

The study produced the first published soft systems application that included systems users, who developed improved agrotechnology transfer models and pursued proposals for change. Although specific soft systems stages were undertaken, resulting in standard outputs, research activities could not be wholly planned because the study affected the situation as it developed over time.

The analyst's role was different from that of a typical graduate student because she worked directly with community members for change. Together they undertook the methodology's seven-stage process. During Stage One, the Graduate Research Agricultural Systems Practitioner (GRASP) program was developed for accommodating her different role.

During Stage Two, the analyst conducted sixty-eight in-depth participant interviews and developed a "rich picture" of the situation. She used the mind-mapping technique for recording how participants described tree crop farming concerns. She administered a demographic and production questionnaire for gathering information about participant characteristics and agronomic practices commonly employed in Kona.

Kona participants mentioned that they were concerned about the amount and type of farming assistance provided by UHMCTAHR. UHMCTAHR participants and commodity organization leaders stated that there were inadequate resources available for meeting Kona's agricultural needs. Some farmers stated that technologies and information developed by well-intentioned UHMCTAHR researchers were inappropriate for their situation.

The analyst illustrated 1) non-crop specific and 2) coffee, macadamia nut, and avocado concerns on composite mind maps according to four participant worldviews. She classified concerns as issue-based and primary-task oriented in order to understand their nature and potential for improvement.

During Stages Three, participants identified concerns that they felt most urgently needed improvement. Participants described activities that would happen in improved situations, who would benefit or lose because of the improvements, who would carry out improvement activities, who had power to help or hinder improvements, what constraints had to be taken as given, and why improvements were meaningful to the situation. The analyst organized this information into concise statements describing improved situations.

During Stage Four, a subgroup of participants developed two improved situation models addressing participant concerns about 1) the level and type of farming assistance and 2) quality and marketing of Kona coffee. At the end of this stage, the analyst suggested various inquiry approaches for other concerns identified during Stage Two.

During Stage Five, activities envisioned in Stage Four models were compared with current activities to determine 1) if and how they existed and 2) what were their measures of performance. Participants suggested proposals for changing current activities in order to achieve functions embodied in the models. During Stage Six, participants debated proposals for change according to their organizational, cultural, technical and economic feasibility and desirability and the analyst mind mapped their responses.

Although not part of planned dissertation research, some participants, assisted by the analyst, undertook Stage Seven activities and developed a strategic plan for implementing feasible and desirable proposals.

The study concluded that:

1) Agrotechnology transfer involved complex human activity systems responding to tree crop farming concerns in Kona. Many UHMCTAHR participants from outside Kona neither understood the importance of relationships existing in Kona's close knit agricultural community nor accounted for them in the agrotechnology transfer process. The application of soft systems methodology accounted for multiple worldviews affecting agrotechnology transfer. It examined desired functions, rather than people or organizations perceived to cause problems.

2) Soft systems methodology as applied to tree crop farming concerns in Kona has caused change: a) the community is now helping itself improve the agrotechnology transfer process, b) the UHMCTAHR administration has met with farmers and noted their needs, and c) the community sought legislative action for providing additional UHMCTAHR manpower in Kona.

3) The analyst amended the original research plan after she began her research. Soft systems research might not be appropriate for studies where programs are set and amendment difficult once research has been initiated.

4) Outputs consistent with soft systems methodology resulted including: a detailed description of the situation, identified and classified themes of concern, statements about improved situations,

improvement models, comparisons between models and current activities, debate on feasible and desirable changes and a strategic plan.

5) Both public and private knowledge were important to agrotechnology transfer. Public knowledge was created by UHMCTAHR scientists via repeatable procedures involving quantifiable factors. Private knowledge was based on people's perceptions and accommodated by soft system procedures which allow multiple definition of problems and potential improvements. If farmers did not believe information and technologies developed from public knowledge were valuable improvements, they did not accept them.

6) Certain key UHMCTAHR staff and farm organization leaders were either not identified or were reluctant to participate in this study. A reiteration of the methodology is needed to include their worldviews because their decisions will ultimately affect if and how the study's outcomes are implemented.

7) The study identified IAP shortcomings. IAP priorities are set by industry members at meetings, however, participants stated that farmers are reluctant to attend meetings in Kona. The IAP does not address cross-commodity concerns which are important to Kona farmers using multiple and intercropping systems. IAP's can not be updated quick enough to meet farmers' needs. Ninety-four percent of the randomly selected farmers and sixty-six percent of the group associated with agrotechnology transfer participating in Stage Six proposed adding the soft system methodology to the IAP process. Guidelines for sharing information gathered by soft system research are needed.

8) Ninety-five percent of the randomly sampled farmers and sixty-eight percent of the group associated with agrotechnology transfer participating in Stage Six favored having on-farm research activities assisting small-scale farmers in Kona.

9) The analyst could not stay outside the study's research. She affected the situation by recording concerns and facilitating discussion about possible improved situations. Completing a doctoral degree was not her only incentive for undertaking soft systems research and she continued to support and work with participants in implementing their strategic plan. Disengagement from the situation was difficult upon research termination. People involved in problem situations, who are and want to be continually engaged in it, should undertake soft systems research. Kona participants requested that someone with soft systems training be permanently assigned in Kona for assisting the community in continually meeting their needs. Would-be soft systems analysts should be screened and evaluated for their communication skills before beginning undertaking research.

The analyst employed several techniques during the study which will be helpful for future soft systems applications. Problems she encountered included: 1) interview delays, 2) participant frustration in dealing with the current agrotechnology transfer structure, 3) communication gaps among participants, 4) funding and time limitations, 5) lack of access to people important in the agrotechnology transfer process, and 6) misconceptions about the nature of the research.

A model to provide agrotechnology and information pertaining to Kona's agricultural needs was developed by a subgroup of Kona participants because most UHMCTAHR participants were unavailable or uninterested. The model, therefore, reflected a worldview prevalent in Kona that the level and kind of UHMCTAHR assistance did not adequately address Kona's tree crop needs. The Kona model was similar to past research-extension models, however, it envisioned technology transfer partnerships where system control would be shared between communities and UHMCTAHR. It outlined need for client-oriented approaches as well as science and technological approaches for responding to tree crop farming concerns in Kona.

Kona represents one community in the state, which consists of a number of such communities. Human activity systems enhancing the viability and sustainability of different types of agricultural activities are needed for various regions of Hawaii. This study did not address the problem of allocating scare resources at a state-wide level. A state-wide agrotechnology transfer model should be developed.

Criticism of using soft systems is that it is too costly because it requires one-on-one interviews, however, techniques for collecting group information could be used. Retail farm equipment suppliers are in direct contact with farmers and, therefore, are important to and should be included in the formal agrotechnology transfer process.

This dissertation applied soft systems methodology for improving a complex, real-world agrotechnology transfer process which involved different worldviews. An adequate assessment is not possible at this time as to the extent to which this soft systems application improved the agrotechnology transfer process, however, it has caused change to occur in the problematic situation. Incentives for using it should be provided to agricultural planners and practitioners, community members and university students.

CHAPTER I

INTRODUCTION

This effort represents the first in-depth application of the soft systems methodology at the doctoral level within the field of agronomy and soil science in the United States. A variety of integrated techniques were needed to assist people involved in a problematic situation in identifying concerns and implementing desirable and feasible improvements. At the time of the study, there were no formal courses and only a few published guidelines were available at the University of Hawaii at Manoa (UHM) to aid the student analyst in making crucial decisions and handling information created while applying the methodology. For those undertaking similar studies, a national curriculum group (Wilson and Morren, 1989 and Bawden, 1986) recently completed texts for use in courses nationwide. Many of the queries and findings discussed by the analyst with individual members of her graduate committee were addressed within these books.

This dissertation presents the background (Chapter II), procedure (Chapter III), application of (Chapter IV) and conclusions about (Chapter V) the soft systems methodology. Tree crop farming concerns in the Kona district of Hawaii were not treated as specialized problems, rather the whole situation was examined intact utilizing a systemic inquiry process explicated in soft systems analysis (Checkland, 1972; 1981). The purpose of this study was to apply soft systems methodology in order to examine and suggest improvements in agrotechnology transfer by looking at it as a process responding to real-world farming concerns. Because soft systems is a new methodology developed in well-defined business situations, its application for improving complex, real-world tree crop farming concerns in Kona, Hawaii had not previously been undertaken. The objective was to undertake the first six soft systems stages in order to respond to concerns of small-scale, tree crop farmers in Kona.

The Role of the Graduate Student (Analyst)

The analyst did not undertake commodity-based research, but applied the soft systems methodology for improving the agrotechnology transfer process. She recorded views of real-world problems from four participant perspectives: 1) randomly sampled farmers, 2) farmers who actively participated in the agrotechnology transfer process, 3) leaders and staff of farm commodity organizations, and 4) University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources (UHMCTAHR) staff who worked with three tree crops (coffee, macadamia nuts and avocados) predominately grown in Kona. During 1987-88, the analyst undertook a series of in-depth interviews with participants who examined their agriculture-related concerns and developed possible improvement scenarios. Proposals for changing or creating agrotechnology transfer activities emerged from these interviews. The analyst recorded participant debate about the feasibility and desirability of implementing these changes.

Because of soft system's way of dealing with problematic situations, the student analyst's role was different than that of other graduate students formerly working in rural communities. Rather than remaining an observer outside the situation under study, she worked directly with people experiencing farming concerns and those involved with on-site agrotechnology transfer activities. She became a catalyst for community change.

Not all UHMCTAHR participants understood the departure of the analyst's work from a traditional research program and that it meant a departure from a traditional graduate student role. UHMCTAHR staff have specific roles which do not allow them to directly assist community members in working for change. Their role is educating in order to enhance the process of agrotechnology transfer without promising additional resources or envisioning major changes that their college might not provide.

Because the analyst was undertaking a graduate degree, she was not responsible for operating according to mandated UHMCTAHR responsibilities; but was subject to rules of the Graduate Division of UHM. A new structure, the Graduate Research Agriculture Systems Practitioner (GRASP) program (Appendix A), was developed during the first stage of the dissertation's research activities to accommodate this new graduate student role. It outlined specific roles for the analyst and her advisors.

Steps Leading to Undertaking Dissertation Activities

The analyst was originally scheduled to undertake her research in the Philippines, examining agrotechnology transfer in a rice production community. In October 1986, the political situation in the Philippines appeared unstable, therefore, a decision was made by the analyst's graduate committee to have her seek a similar setting for the study in Hawaii.

An unpublished paper by the analyst, resulting from a graduate seminar presentation in 1986, was distributed to the County Administrators of the Hawaii State Cooperative Extension Service. The paper was subsequently channelled to county extension agents for consideration and, a county extension agent stationed in Kona, responded that he was interested in participating in the study. An on-site visit in February 1987 provided the analyst a first-hand look at the potential research site and an opportunity to meet the extension agent. During this first encounter, the extension agent stated that UHMCTAHR had limited staff and resources available for responding to West Hawaii County's growing needs. He welcomed the study as having potential for improving the agrotechnology transfer process.

At that time, a suggested avenue for study was to examine the adoption of a biological pest control of the macadamia nut stink bug, *Nezara virdula*, in Kona. The technology involved planting a preferred host, *Crotalaria incana*, as a trap crop around macadamia nut orchards. Upon return to Honolulu, the analyst prepared a research plan for examining stink bug integrated pest management and circulated it to UHMCTAHR staff for comments.

After dissertation research activities were initiated on 1 April 1987, on-site factors required modifications to the original research plan. The analyst found that farmer concern about macadamia nut stink bugs was almost nonexistent. The plan was amended to apply the soft systems methodology for improving agrotechnology transfer by looking at it as a process that responded to concerns of small scale, tree crop farmers in Kona. It identified concerns that needed to be addressed, envisioned possible improved states, and debated potential improvements. Two groups of participants were identified by the analyst for the study: 1) those visibly active in technology transfer (researchers, extension staff and commodity organization leaders), subsequently referred to as the "TT Group" and 2) a group of farmers selected at random who may or may not be actively engaged in agrotechnology transfer activities. The objective was to see if there were differences in viewpoints between and within these two groups about tree crop farming concerns and opportunities; and what potential improvements could be made to the agrotechnology transfer process responding to tree crop farming concerns.

Because the study was a first attempt, many decisions about applying the methodology were made and recorded. The analyst kept a written journal of her experiences as a soft systems practitioner until the study ended nearly ten months later.

Although the dissertation's research activities terminated at the end of January 1988, the analyst found it difficult to become disengaged from a process in which she and the Kona community were involved. Participants from Kona subsequently used research results as a basis for a strategic plan and implemented action-oriented programs. Even after the analyst's research was completed, the process of using soft systems methodology for improving agrotechnology transfer activities responding to Kona's concerns continued to be undertaken by community leaders.

Factors Affecting the Study

A. Agrotechnology Transfer in Hawaii

The University of Hawaii (UH) is the institution that provides a broad spectrum of educational, research and community activities in Hawaii. Figure 1 presents an organizational chart highlighting UH entities relating to agricultural activities. This state-wide university system is governed by a Board of Regents who is appointed by the governor and is approved by the state legislature. The president of the university system is directly responsible to the Board of Regents. There are campuses of the University of Hawaii at Manoa (UHM), the University of Hawaii at Hilo (UHH), West Oahu, and six community colleges. Deans of the colleges of UHM, the chancellor of the Hawaii community colleges and the chancellor of UHH and West Oahu College report directly to the UH president.

UHH is responsible for providing educational opportunities on the Big Island. During 1987-88, a few agricultural business courses were offered at UHH's West Hawaii Campus in Kona. UHMCTAHR provides educational opportunities in agriculture for students from all islands at UHM's main campus at Manoa. UHM has state-wide graduate education responsibility.

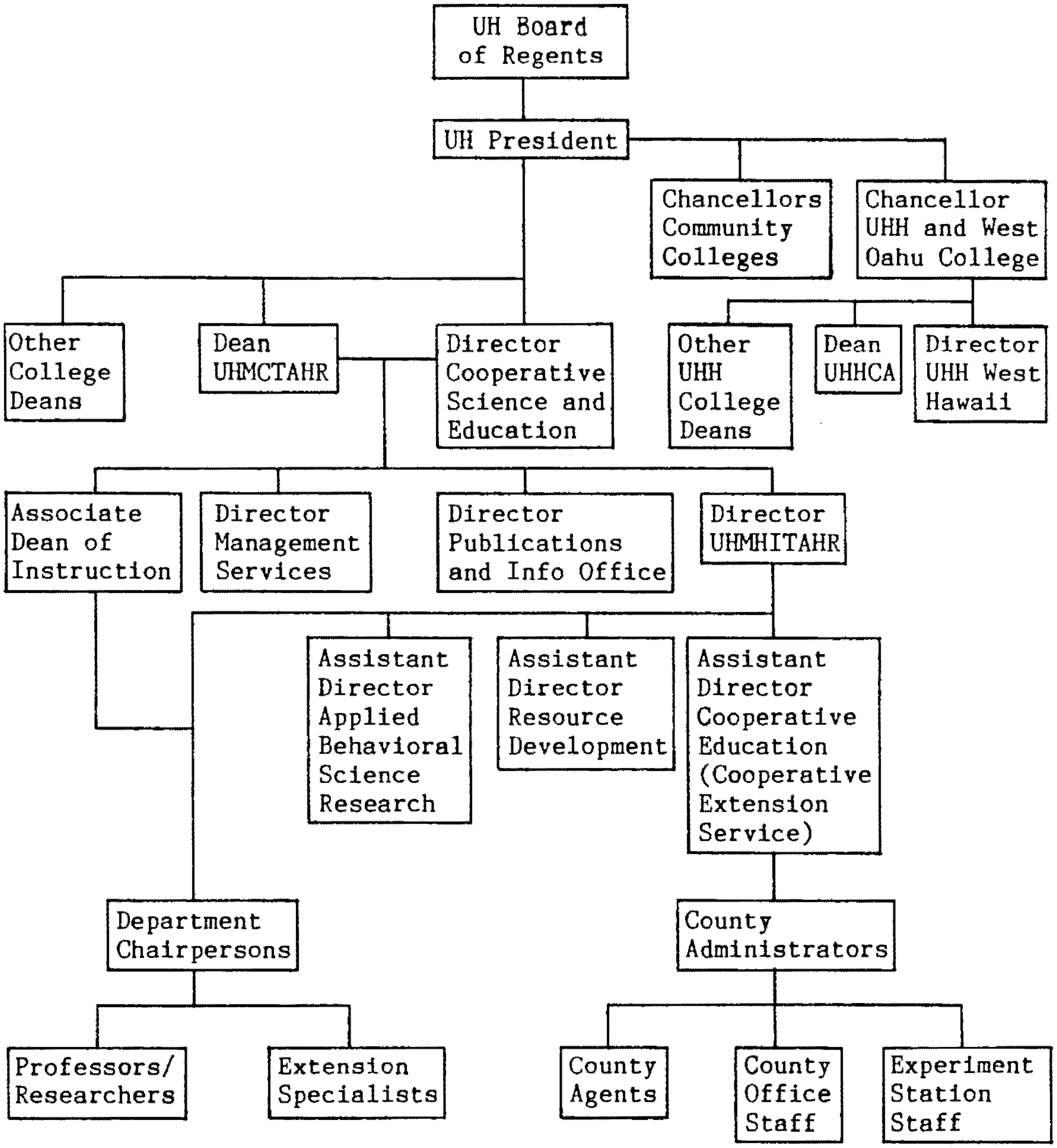


Figure 1. Organizational Chart Highlighting UH Structure Pertaining to Agriculture

UHMCTAHR, a Land Grant college, is mandated to undertake agricultural research and extension activities under the Morrill Acts (1862 and 1890) and Hatch Act (1887). The Hawaii Institute for Tropical Agriculture and Human Resources (UHMHITAHR) is the UHMCTAHR arm providing state-wide agricultural research activities. State government and UHMCTAHR administrators allocate a limited amount of resources for agricultural research and extension activities addressing problems associated with thirty or more Hawaiian commodities.

B. Geographic Factors

Most people are familiar with Hawaii's location (2390 miles - 3,846 km from California) because of its large tourist industry. Hawaii, the only US state comprised entirely of islands, consists of eight main volcanic islands and many small uninhabited atolls. Native settlers to Hawaii probably came from the Marquesas Islands of Polynesia, however, more recent immigrants (Japanese, Caucasian, Chinese, Portuguese, Spanish, Puerto Rican, Filipino, and other Pacific Islanders) added to the ethnic variety of the islands. Almost 80% of Hawaii's population resides on the island of Oahu where Honolulu, the state's financial and governmental capital, is located. (UHM, Department of Geography, 1983).

The location for this dissertation's research activities was the Kona district of Hawaii County on the Big Island of Hawaii. Kona is a two hour drive from Hilo, the seat of Hawaii County. Additional background information about the state of Hawaii, Hawaii County and the Kona district, collected by the analyst during this study, is presented in Appendix B. Figure 2 presents a map illustrating the study's research location.

In 1986, only 138 sugar and pineapple farms produced nearly 70% of the total state crop sales (State of Hawaii, Hawaii Agricultural Statistics Service, 1986); utilizing large-scale, single crop production systems. In Kona, however, over 1500 farmers raised a variety of crops under small-scale, multiple cropping systems. The majority of the state's coffee (*Coffee arabica*), macadamia nut (*Macadamia integrifolia*) and avocado (*Perses americana*) producers live in Kona. This study focussed on improving the agrotechnology transfer process responding to concerns of these small-scale, tree crop farmers.

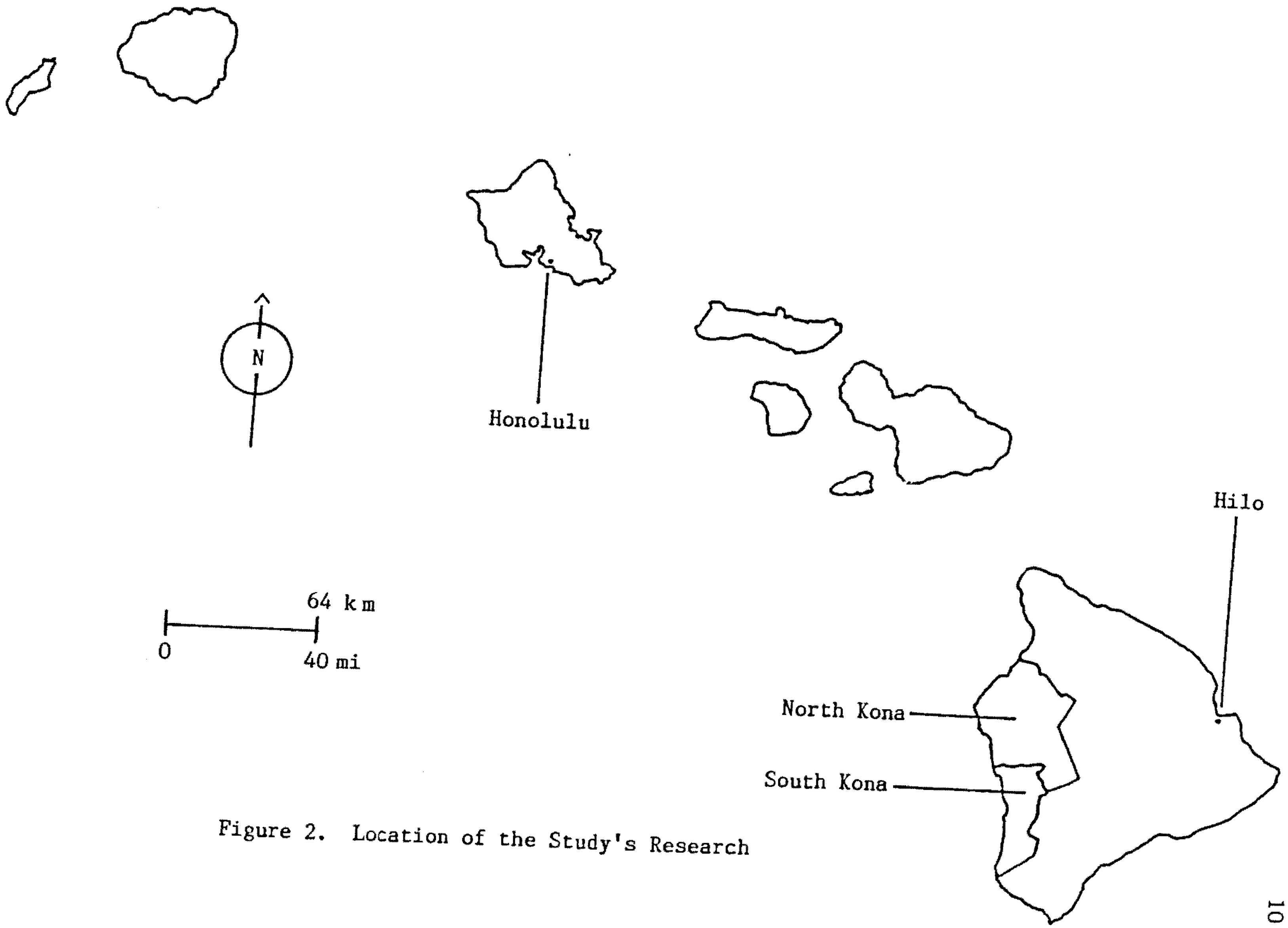


Figure 2. Location of the Study's Research

CHAPTER II

LITERATURE REVIEW

Agriculture is the management of natural and human systems associated with food and fiber production (Bawden et al., 1984). Technology represents knowledge necessary for the productive functioning of a system: including production, marketing, management and user information (Fund for Multinational Management Education, 1978). A technology can be manifested in the form of an innovation or tool (Hough, 1975). Agrotechnologies and information are designed for assisting people in better managing complex interacting physical, biological, economic, social, cultural and political situations affecting farming.

Since the green revolution of the 1960's there has been concern that the process of agrotechnology transfer is not efficient. Lower crop productivity at the site of dissemination (farmers' fields) than at the site of development (experiment stations) is often reported (DeDatta et al., 1978). Uehara (1984) attributed success of agrotechnology transfer to matching innovation requirements to physical site attributes and cultural characteristics of recipients. Past studies (DeDatta et al., 1978) examined the process (involving several interacting activities) of agrotechnology transfer by reducing it into manageable components for systematic research. Innovations were examined that were developed 1) in one place, taken to another, and were used at the second place by the same people that developed them or 2) at one location by a person or group of people different from those for which they were designed. Technology development was left to researchers who employed science-based methodologies for identifying a limited number of hypothesized factors that they perceived caused transfer inefficiencies. Studies on "transferring" agrotechnology were done by a specialized field of communications research, Diffusion of Innovation Research (Rogers, 1983). Agricultural extension agents applied Diffusion of Innovation guidelines in order to increase the rate of adoption of agricultural innovations. Much to the dismay of well-intentioned research and extension personnel, farmers still failed to adopt carefully "designed" and "transferable" innovations. Studies employing similar reductionist techniques were initiated for explaining why rejection happened and systematically improve delivery system components (Rogers, 1983). Little attention, however, was given to holistically examining the agrotechnology transfer process itself. Agrotechnology transfer, however, probably began when a farmer looked over at a neighbor's field, copied some cropping practice that the neighbor had developed, decided the neighbor's was better than his/hers and adopted it. It involves a unified, synergistic process that designs, develops, disseminates and uses technology and information.

Farming systems research and extension (FSR & E) emerged in the 1970's as an approach for assisting small-scale farmers in less developed countries by involving an interdisciplinary team of experts that develop adaptable technologies on-site (Shaner et al., 1982). The merits of FSR & E are many, however, the methodology lacks well-defined procedures for guiding its practitioners. Complex farm problem situations and the process of agrotechnology transfer are examined with reductionist, component-based research techniques. At the onset of a project, a rapid rural appraisal technique, the 'Sondeo', systematically identifies problems upon which subsequent science-based research activities are initiated. This appraisal (often completed in a matter of weeks) does not provide a means to fully account for multiple views of problems, opportunities and performance measures pertinent to problematic farming situations. Such an appraisal should be broad enough in focus for grasping complexity of simultaneous interactions of several levels of human activities and environmental factors affecting the agrotechnology transfer process responding to farming concerns. An adequate procedure is lacking for linking research and extension activities which are often separately undertaken.

Agricultural problem situations require various inquiry and intervention approaches because of the multiplicity of factors interacting in real-world situations (Bawden et al., 1984). Although farmers have been plagued with problems since cultivation began, various methodologies for tackling complex, real-world farm problems only recently were defined. The Food and Agriculture Systems Task

Group of the United States National Agricultural and Natural Resources Curriculum Project (1986), introduced agricultural systems approaches nationally to supplement existing undergraduate agricultural curriculum in universities affiliated with the National Association of State Universities and Land Grant Colleges (NASULGC); the American Association of State Colleges and Universities (ASSCU) and the 1890 Colleges and Universities.

Four distinct methodologies are currently being adapted, tested and used by agribusiness, university personnel, and farmers. They are: 1) basic science inquiry, 2) applied science or technology development, 3) hard systems inquiry, and 4) soft systems inquiry. They have spread worldwide and have become major paradigms for assisting agriculturists to work with farm problem situations (Bawden, 1986; Lippke et al., 1987). The Hawksbury School of Agriculture in Australia is a recognized leader in the extent to which agricultural systems practice pervades the entire conceptual base of curriculum across all disciplines (Bawden et al., 1984; Macadam and Packham, 1984).

Systems and Scientific Thinking

Systems thinking, traceable to the Greek philosophers and mathematicians, was recently adapted for improving complex problem situations in the 1970's by a group of systems methodologists lead by Peter Checkland at the University of Lancaster in England. Much of the following review reflects the development of the theory and practice of systems thinking for intervention into human problem situations (Checkland, 1972 and 1985a), as outlined in Checkland's (1981) book, Systems Thinking, Systems Practice. Checkland (1972) first described and used a specific systems based procedure, soft systems methodology, to study and improve complex, real-world problems in private business firms. Checkland (1985a) challenged soft systems analysts to use the methodology for improving problems occurring in a multiinstitutional, multilocational problem situations, such as those associated with agriculture. The agricultural systems approach of the Food and Agricultural Systems Task Force (1986) augmented Checkland's methodology with ideas from Kolb's (1986) learning theory. Wilson and Morren (1989) modified the methodology to better account for natural resource situations, added new techniques, further defined and explained the methodology, and developed a new approach for thinking about when and how each of the four methodologies should be used.

Greek philosophers laid ground work for modern rational scientific thought. They initiated observation techniques and postulated concise mathematical laws explaining regularity of the universe. During the middle ages a specific methodology, the scientific method, developed and involved undertaking controlled experiments. Newton later added elements of empirical research and theoretical explanation to the methodology. By the 1800's, well-defined scientific research procedures produced testable knowledge. Checkland (1981) stated that scientific thinking complemented systems thinking. He described scientific research in its broadest sense as a human activity system created for acquiring knowledge.

Checkland (1981) identified two types of knowledge: public and private. Public knowledge is testable and can be verified by undertaking carefully controlled, repeatable experiments that produces measurements that are not influenced by experimenter bias. Private knowledge is what people believe is true and is created by opinion, preference and speculation.

Holism

Aristotle proposed that there was more to a whole entity than the sum of its parts and that mathematical models might not adequately describe natural and human phenomena because they subdivide study areas, pinpoint key factors and examine them closely. He also described 'wholes' by activities they perform (function) rather than solely by their structure. (Checkland, 1981).

Checkland (1981) and Wilson (1984) proposed that the basic philosophical premise guiding systems thinking was that activities occurring in the world were arranged, not chaotic, in orderly wholes called "systems". Holist thinking presupposes that wholes act in certain ways (synergistically and systemically) that are different from the ways in which their individual components act if examined separately (Lippke et al., 1987).

Wilson and Morren (1989) stated that systemic thinking could aid in more effectively handling complexity of situations. Checkland (1981) stated that systems thinking was based on the premise that "systems" do not actually exist but are useful conceptual maps created by human minds for organizing information into hierarchical "models" or forms. A system is a construct of the observer who defines what it is and what it is supposed to do; it is a product of its creator and a whole entity doing something. Systems are irreducible wholes that, if their components are divided and examined separately, they lose their distinctive characteristics which allow the observer to examine them as unique wholes. Conceptualizations of a "system" vary among people in the problem situation (Singley et al., 1986). Systems represent conceptions and organized ways to cope with reality (Wilson and Morren, 1989).

Reductionism

Contrary to Aristotle's holistic thinking, Descartes described the world as characterized by ordered regular phenomena that could be broken down and examined as separate components (Checkland, 1986a). Reductionist thought assumes that dividing phenomena into their parts is not harmful and putting components together can restore the phenomena split apart by the reducing process (Lippke et al., 1987).

The scientific method, which emerged as an outcome of the 17th century industrial revolution, is one of the greatest inventions of Western Civilization (Checkland, 1981). Scientific inquiry attempts to explain regularities of the universe by determining laws that are, as often as possible, expressed mathematically. Checkland (1972) defined today's scientific method a "methodology". He (1981) further described it as being characterized by refutation (the formulation of provisional hypotheses that were accepted until disproved), reduction (a focus on a few quantifiable factors), and repeatability (undertaken via controlled experiments). Scientific inquiry reduces phenomena to "uncover" facts and then draws on prior accepted "scientific" knowledge to explain them. Little and Hill (1978) outlined scientific method to include: observing phenomena, isolating key variables, postulating hypotheses, planning and undertaking controlled research, analyzing results and drawing conclusions.

Checkland (1981) identified two types of problems: real-world and scientific. He stated that scientific problems could be defined, limited, selected, and examined by means of science-based inquiry procedures. Real-world problems, which often require immediate management decisions, are not easily definable and can not be tested under laboratory conditions because they involve management of complex problem situations created by humans. Optner (1965) in Checkland (1981) proposed that businesses executives should not treat complex management problems as special cases but rather normal to running business operations.

Checkland (1981) described science-based inquiry as inadequate for managing real-world problems because they require decisions often based on private knowledge. He stated that basic science inquiry was inadequate when problems call for more than an explanation of physical regularity because they deal with complex, social phenomena often involving irrational human behavior. Wilson and Morren (1989) described basic science inquiry as an attempt to explain why a phenomenon is as it is, not how to improve situations caused by it. Applied science inquiry attempts to use "facts" from basic science inquiry to develop technologies that alleviate problems.

Often problems can not be defined clearly for laboratory experimentation and one agreed-upon, "satisfactory" solution is not attainable. Solutions to real-world problems rarely can be agreed upon because people view and describe their concerns differently. Checkland

(1981) used the German word, "Weltanshauungen", to describe people's viewpoints (worldviews) about situations. Wilson and Morren (1989) described Weltanshauungen to represent the sum of an individual's or group's personal experiences, emotions, values, attitudes, beliefs, morals, tastes, social conditioning, intelligence and knowledge. It gives situations meaning and a sense of preference for potential improvements.

Checkland (1981) stated that Western civilization values creation of public knowledge vis-a-vis science-based research. The "success" of utilizing scientific method can be evaluated because of consensus that reductionism, refutation and repeatability are accepted components of the scientific worldview. Checkland (1981) stated that eventually a body of public 'systems knowledge' might be developed through systems thinking.

During the 1800's, educational institutions created distinct areas of specialization. Subject material was channelled to highly specialized academic disciplines for component research. Wilson and Morren (1989) suggested that scientific procedures are unable to cope with interactions among factors, especially those crossing discipline boundaries and that the narrow focus of scientific disciplines limits their usefulness at tackling real-world problem situations.

"Human" problems are traditionally viewed as applicable to social science-based research. Checkland (1981) stated that natural scientists generalize, predict and empirically derive laws but social scientists can not because 1) the complexity of social phenomena does not lend itself to reductionist research techniques, 2) the variation of worldview's involved creates both public and private knowledge and 3) predictions by human "subjects" may affect future research outcomes. Woelfel and Fink (1980) suggested that social scientists should augment their training with mathematics in order to understand and appreciate a natural science perspective. They suggested that calculus can assist in viewing social phenomena as a continuum and developed a statistical technique, Galileo, for measuring changes in perceptions over time.

Systems properties

Checkland (1981) proposed that hierarchy, emergence, communication, and control are four main concepts behind systems thinking. In the early 1900's, microscopes allowed organismic biologists opportunity for viewing the hierarchical arrangement of biologic structures. Checkland (1981) stated that systems are conceptually organized hierarchical forms. All systems are subsystems of wider systems. Some systems are larger, involving complex or abstract functions, while other systems are minute with limited function and levels of resolution. Systems transform inputs into outputs that are transferred among systems. Higher systems often create inputs for lower-order systems. (Wilson and Morren, 1989).

Systems do not consist of randomly arranged components, rather they exhibit a high degree of organization. A systems analysis identifies nested, structured wholes which have identity and exhibit synergistic, emergent properties at different levels of resolution. Complex, ordered structures process and organize inputs, information, and energy which result in emergent properties that are meaningless if examined at the reduced component level. (Checkland, 1981). Wilson and Morren (1989) stated that a given research approach is inappropriate if key properties of a phenomenon are reduced to a point where vital aspects (properties) are lost.

Communication and control features operate among and within systems at different levels of hierarchy (resolution). They create and maintain system order and allow the system to survive in a changing environment (Checkland, 1986a). Systems operate by maintaining (via control mechanisms) their components within a range of conditions. Systems transform themselves or are transformed by changes in these conditions. Feedback control mechanisms operate when information from current operation is communicated throughout the system in response to disturbances and imbalances are then corrected. Feedforward communication mechanisms anticipate responses that can enhance system efficiency.

Types of Systems

Checkland (1981) and Wilson (1984) identified four types of systems that conceptually represent various types of situations: a) natural, b) designed physical, c) designed abstract, d) and human activity systems. They are hierarchical in form and, if reduced, the characteristic nature of their existence (emergence) is lost. Natural systems originated with the beginning of the universe or via evolution and consist of distinct patterns that can be observed and described. Science-based research describes and determines laws governing components of natural systems at a well-defined level, often involving a few key observable factors, and is unable to examine unique systems properties that exist because systems are entities operating as wholes. (Checkland, 1981).

According to Checkland (1981), designed systems are purposive, that is, they are contrived systems created to serve a purpose. They are not products of evolutionary forces as natural systems are, rather they can be modified to meet alternate user requirements. Some designed systems are physical in nature, e.g. a crop harvester; others are not restricted to having a physical basis, e.g. calculus; but all represent entities created by humans to perform specific tasks. Science-based research techniques are traditionally employed for studying natural and designed systems.

Human activity systems involve linked sets of activities considered as groups of wholes that exhibit systems properties. Checkland (1981) described them as purposeful because they result from choices made by people undertaking or controlling the system's activities. Natural and designed systems are often needed to carry out activities "developed" and organized by human activity systems. Human activity systems are not verifiable (repeatable through controlled experimentation) but consist of valid viewpoints (worldviews) of different people's visions of a situation that determine "what is" and "what ought to be". A purposeful human activity system consists of various activities depending on different observer perceptions of what is needed to achieve a desired function. Historians develop systems for describing man's activities over time, managers use systems for enhancing business activities and engineers design new or manipulate existing systems for meeting desired measures of performance. Bawden's (1986) agroecosystem approach considered the interaction between man-made (agricultural) and natural systems.

Checkland (1981) stated that two differences exists between natural, designed physical and designed abstracts systems and human activity systems. He stated that these differences must be considered when developing approaches for improvement:

1) The observer (analyst/researcher) can not be a member of the thing(s) being observed (subjects/participants) in natural or designed systems. Procedures are undertaken to minimize the impact of the observers when recording data. With a human activity system, the observer is usually unable to keep his presence a secret and begins to affect the human activity system immediately after research is initiated. Subsequent actions often affect the group's future behavior.

2) Natural and designed system units consist of innate objects that can not think, however, human activity system's participants are people with the power to speculate about and choose their destiny. Various accounts (worldviews) for the meaningfulness of unreplicatable situations occur in human activity systems. Future system output can be drastically affected by people's prediction or vision of the future. Approaches for studying human activity systems have to be able to take into account the effects of the observer on the system as well as different participant viewpoints that exist which can affect future human activity system activities. (Checkland, 1981).

System Components

Checkland (1981) developed and adapted a list of "formal system" components based on the outcomes of actual case studies that were undertaken after World War II (Churchman, 1971; Jenkins 1969 in Checkland, 1981). The following features were identified as general components essential to the functioning of a system.

1) It has a goal, objective, on-going purpose, definition of a final desirable state, or mission. It performs some type of function.

2) It has a measure of performance to evaluate progress to reach the ends listed in (1).

3) It has a decision taker role which commands a decision making process.

4) It has resources; physical, human, or engineered; which are marshalled via the decision process.

5) It exists in wider systems or environments and interacts (receives inputs and disperses outputs) with them. Boundaries are defined by the area within which the decision process can maintain control.

6) It has interacting subcomponents which are connected so that effects and actions are transmitted through the system.

7) It has sub-components which are in themselves systems with the characteristics described above.

8) It has a degree of continuity and can recover after disturbances.

Lippke et al. (1987) stated that managers of agricultural systems should use the above listed items to describe biological, economic, social and technical subsystems in order to influence them.

Philosophies, Methodologies, and Techniques

Checkland (1981) distinguished between philosophies, methodologies and techniques (methods). He described a philosophy as something that formulates theoretical bases for action, rather than spelled-out procedures. A philosophy can be used to determine what people are doing and why it is important. It represents a collection of value-based knowledge upon which subsequent decisions are weighed and undertaken. A technique is a precise action, which if properly taken, produces a standard result. If two people use a particular technique (e.g. Analysis of Variance) for addressing the same problem, the outcome is the same (F scores). Techniques are tools, the hows, that assist in tackling problems and are not encompassing enough to account for the variety of factors operating and information generated during problem situations.

Methodologies lie between philosophies and techniques, yielding theory and guidance in dealing with problems found in real life situations. Methodologies provide structural procedures for investigating problem situations but do not distort them into a "preconceived or standard form" (Checkland, 1981). Bawden et al. (1984) defined a methodology as a logical, orderly manner to find out, think about and take action. A series of phases with a minimum set of inquiry activities (stages) are conducted within a methodology. Checkland (1981) stated that within the limits of the basic premises of a given methodology, researchers can use their own personalized styles to undertake research and that <u>whats</u> as well as <u>hows</u> are involved.

<u>Methodologies For Tackling Farming Concerns</u>

The Food and Agricultural Systems Task Group (1986) identified four methodologies useful for tackling natural resource and agricultural problem situations: 1) basic science inquiry (discovers the nature of phenomena), 2) applied science or technology development (asks "What technology could be made or revised to meet the requirements of this situation?"), 3) hard systems inquiry (allocates resources often with optimization and simulation objectives), and 4) soft systems inquiry ("improves" human activity systems as well as designed and natural systems). Basic and applied science methodologies are reductionist in logic processes and concentrate on undertaking single component analyses. Systems-based inquiry methodologies utilize holistic thinking to develop optimum or improved systems. Wilson and Morren

(1989) stated that agricultural practitioners need to be skilled at using all four methodologies because the choice of which one to use depends on the type of problem being addressed, not the analyst's competencies.

Checkland (1972) developed two types of systems-based methodologies: "hard" and "soft" systems methodologies. The nature of the problem being addressed determines which systems methodology is most appropriate to employ. The terms "hard" and "soft" systems have very precise meanings in systems' literature; however, they are misunderstood by people who do not take the time to explore the epistemology behind them. In addition, these terms tend to cause people to make certain value judgements (e.g. one is difficult and one is easy or one relies on quantifiable data and the other does not) which does not conform to the precision of the terms as used and developed by systems' methodologists Checkland (1981), Naughton (1984), Wilson (1984) and Food and Agricultural Systems Task Group (1986).

Hard Systems Methodology

Checkland (1981) and Lippke et al. (1987) noted L. von Bertalanffy as the founder of modern day systems theory because he recognized that systems concepts can be applied across academic discipline lines established by reductionist thinking. Von Bertalanffy believed that mathematical descriptions of systems could be developed to express unity (holistic thinking) and developed a "General Systems Theory". During the second World War, operations research was developed by scientists given the task of efficiently allocating resources within military operations. After the war, the RAND corporation combined systems engineering and systems analyses for problem solving. Thus hard systems resulted. (Checkland, 1981).

Wilson and Morren (1989) proposed that hard systems methodology is most effective when outcomes from analyses can be understood and agreed upon by all. It assumes that the goals of the inquiry are definable, without major difference of opinion among analysts and people/groups involved, and has its best application when preceded by a soft systems analysis.

The hard systems analyst often assumes the role of "expert", responsible for 1) determining the goals of the inquiry and how best to reach them, 2) determining the system's key components and performance measures, and 3) developing a model of systems in which resources are allocated in an optimum way (Wilson and Morren, 1989). A hard systems analyst develops purposive systems, often dealing with allocating (manipulating) resources in a natural system or the need for a better physical system design (Bawden, 1986). Models developed by a hard systems analyst tend to reflect the analyst's definition of the requirements of the "best" system and result in the development of an "optimum" system reflecting the analyst's assumptions of the most desired relationships between the system's inputs and outputs. In biological systems modeling, models reflect the researcher's conceptions of a present state and ideal states and what would happen if certain variables were changed. A hard systems model once written will determine and organize inputs. For example, a hard system model will optimize corn yields from inputs given. Optimum business solutions are often determined by economic efficiency. A hard systems analyst can design a scale model of a bridge if villagers need one to reach their fields that lie across a river. (Wilson and Morren, 1989).

During the 1960's, the hard systems approach to inquiry was used by politicians in California for examining complex social problems requiring resource allocation decisions (e.g. transportation and prison systems) (Hoos, 1972 in Naughton, 1984). The approach proved inappropriate, however, because the goals (or improved conditions) could not be clearly defined and agreed upon by all involved in the system. (Churchman, 1971 in Checkland, 1981; Checkland, 1985b).

Soft Systems Methodology

In 1965 the Checkland group in the Department of Systems at the University of Lancaster, began to look at human problems and goals which were not easily defined, singularly understood, or accepted. Checkland's group was interested in identifying key systems concepts that could be applied to tackling complex social problems; hence soft systems methodology resulted. Since the middle 1970's, the Open University of London has offered a course in systems methodologies applied to food production, business and social and natural resource management (Naughton, 1984).

Rather than reducing problems by examining their components and then developing experimentally testable hypotheses, soft system developers sought a different way for understanding and dealing with complexity found in problem situations. They borrowed an action research approach from social science as a guide for soft system's inquiry process. Action research in general and soft systems methodology specifically assumes that researchers can not stay outside study areas when undertaking analyses and that amendment of research plans may be required as situations under study change. Wilson and Morren (1989) stated that it may be impossible to effectively undertake soft system study unless researchers accept the fact that they become part of the "problem" under examination as well as actively involved in facilitating change.

The Food and Agricultural Systems Task Group (1986) determined that soft systems methodology is a most appropriate choice for addressing complex, real-world problems which are defined according to different worldviews. People often know that problems exist but can not specifically define them or agree on their severity. Soft systems methodology can examine problem situations where perceptions of problems are subjunctive (based on private knowledge) and change over time.

Soft systems methodology (according to Checkland, 1981) consists of seven stages (Figure 3). Its procedure aids in accounting for worldview differences for 1) defining the problem situation, 2) envisioning improved states and 3) proposing, debating and implementing change strategies. Systems thinking pinpoints problems occurring when existing conditions are mismatched with people's perceptions of what an improved world could be. A systems approach helps facilitate communication and clarify lines of authority (control) for alleviating a sense of unease which develops due to these mismatches. (Wilson and Morren, 1989).

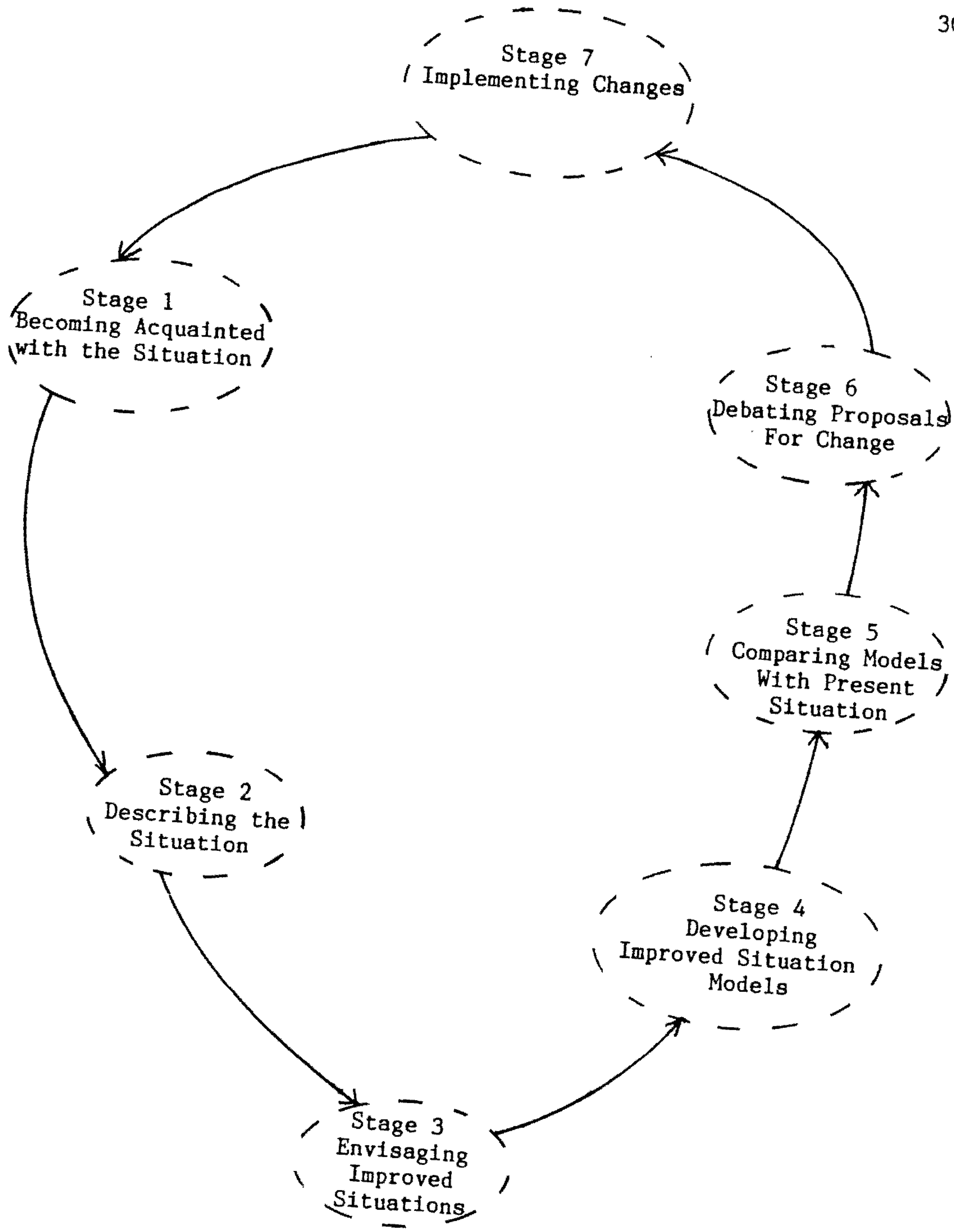


Figure 3. Stages of the Soft System Methodology

Soft systems methodology develops models of purposeful, improved human activity systems perceived by those experiencing problems to be "relevant" to the situation in order to define their visions of "improved states". These improved states are compared with key features of the present situation and a debate about proposals for desirable and feasible changes is then undertaken by people in the situation. (Checkland, 1986b). Once all parties find a purpose which is desirable and feasible, then "solutions" or alternative ways for achieving that purpose are discussed. The final outcome of the soft systems methodology is the development of a strategic plan of action that implements the agreed-upon vision of an improved condition. (Wilson and Morren, 1989).

Outputs of the Soft Systems Methodology

Naughton (1977) in Checkland (1981) proposed two sets of soft system methodology rules: constitutive (essential) and strategic (helpful). Constitutive rules outline the methodology's seven stage process and include the following stage-specific outputs: 1) a rich picture, 2) relevant systems, 3) root definitions, 4) conceptual models, 5) a comparison exercise and 6) a debate on feasible and desirable changes. Wilson and Morren (1989) added a strategic plan as a seventh output.

During Stage Two, a rich picture is developed that fully describes the problem situation. Wilson and Morren (1989) stated that a rich picture contains quantitative information about organizational and social structures, people, lines of authority and communication, activities that occur or should occur, and statistical data describing the situation. Any public knowledge created by previous science-based research is also included. It also contains qualitative information based on private knowledge - hunches, feelings, constraints, opportunities for improvement and perceptions expressed by people engaged in the situation. The rich picture provides a basis for understanding the problem situation: specifically who is engaged in it and what are their roles and viewpoints, how decisions are made and enforced, how the situation developed, what factors outside the situation affect it and other numerical data and information indicated by participants as related to the problem situation.

Although Naughton (1977) in Checkland stated that <u>relevant systems</u> were created during Stage Two, Wilson and Morren (1989) discussed that this activity, which they refer to as defining improved states, occurs during Stage Three. Relevant system statements define concerns which people experiencing the problem situation feel are most pressing and in need of improvement. Relevant system statements outline how improvements might appear in improved states and what activities are needed to perform critical functions necessary for improvement. These are based on people's values, norms and expectations of what would make their world better, their worldview of improvement. These include human activities needed to perform critical functions necessary for improvements.

During Stage Three, <u>root definitions</u> are made using a technique with the acronym, CATWOE, as developed by Smyth and Checkland (1976) (pp. 45-46). Root definitions are complete statements defined by those experiencing the problem situation about the context in which improved functions should occur.

During Stage Four, visions of organized improved states, conceptual models, are formed based on linked verbs described by root definitions. They visually present human activity systems designed to produce desired activities. Models embody the essence of root definitions and do not represent actual systems; rather they perform the function of stimulating debate on potential changes. System inputs (resources), outputs, lines of authority (control) and information flow (communication) are determined. Wilson and Morren (1989) developed a ten point set of guidelines to complete Stage Four's models (p. 48). Systems components (pp. 23-24) are used to verify models developed during the methodology.

Activities embodied in conceptual models developed during Stage Four are then compared with activities occurring during the current, problematic situation in order to determine if the conceptual model activities occur and how their performance is currently measured. From this comparison exercise, proposals for change emerge.

During Stage Six proposals for change are debated for their organizational, cultural, technical and economic desirability and feasibility. Organizational changes are debated about structures that are designed to carry out proposed activities. Cultural changes are debated as to whether proposed activities are acceptable to people in the situation based on their values and views of what they think would make their world better. Questions of technical feasibility address whether or not people think that the proposals are well thought-out so that they can be successfully implemented. Decisions about technical feasibility require scientific or managerial knowledge. Debate on economically feasible changes focuses on the feasibility or implementation of the proposal given existing financial constraints. (Wilson and Morren, 1989).

A strategic plan outlining a specific program for actually implementing agreed-upon, feasible and desirable changes is developed as an outcome of Stage Seven's activities. The strategic plan includes 1) a clear statement of proposed future critical functions needed to actualize improvements, 2) who would carry out the activities, 3) how the performance of improvements would be measured, including the means to determine if and when action was completed, and 4) what resources would be needed. (Wilson and Morren, 1989).

Naughton's (1977) strategic rules in Checkland (1981) suggested other soft system outputs including: 1) an identification of the situation's structures, processes and climate, 2) themes of concerns that are identified as primary-task or issue-based, 3) a reluctance to describe the situation in system's terms and 4) a need to repeat the seven stages. These are dependent on the personal style of the analyst using the methodology.

During Stage Two, the rich picture describes the structures, processes, and climate of a problem situation. Structural features describe physical and organizational entities that facilitate or hinder undertaking of desirable and undesirable, feasible and not feasible functions. Structures include laws, political entities, reporting mechanisms, formal leadership patterns, and past associations that were formed to undertake specific activities. People operate within structures by assuming (or are appointed to) roles that have expected behavior patterns and exercise authority and power. Structures are considered relatively slow or difficult to change because they involve 1) previously determined roles and 2) laws designed in response to needs that have since become institutionalized. Process features describe key activities occurring in the situation and who is doing them. They involve interactions among people, programs, and physical or organizational entities. They occur within or in spite of well-defined structures and result from decisions made within structures. Processes are viewed as easier to initiate, amend or scrap than slower-to-change structures. The match between the situation's slow changing structures and fast changing processes is referred to as the situation's climate. It is characterized by the amount of stress, frustration or helplessness expressed by people when they discuss the problem situation. A soft systems analyst's role is to record what sense of unease exists, how issues came to exist and who is disagreeing with whom. (Wilson and Morren, 1989).

Themes of concern describing problematic aspects of the situation are identified. Wilson and Morren (1989) expanded Checkland's (1981) discussion of the classification of concerns as issue-based and primary-task oriented. Issue-based concerns include those which people relate to: 1) their or an organization's survival, sense of well-being or lifestyle, 2) projects undertaken by other people which affect them, 3) long-range planning, 4) due process (feeling left out of a decision making process when they feel that they are supposed to be included), and 5) generic concerns (associated with an entity's reason for existing). Primary task concerns are identified as addressing existing or lacking activities mandated to specific people, groups and organizations. Primary task concerns deal with a group's sense of reason for being or mission.

When the problem situation is described during Stage Two, what are perceived to exist as systems are not identified as such because this might result in steps to "optimize" them, which is not the purpose of using the soft systems methodology. The situation is not described by its systems properties because this might imply nonexistent connectivities (systems communication and control).

Stages of the methodology are to be iterated. Defining human activity system purposes (end states) are problematic because people change their viewpoints over time. Stages of the methodology can be iterated because they are grounded on action research which is not wholly planned or directed. Research plans are often modified to follow situational changes over time. (Checkland, 1981). McClymont (1982) observed that viewpoints of participants changed during diffusion of innovation processes.

Evaluation of the Soft Systems Methodology

Checkland (1981) stated that soft systems methodology could not be evaluated via verifiable, repeatable experiments because no two social problems are identical. Real-world problems are not often agreed-upon and "solutions" (consensus) rarely result. He suggested that the methodology's success needs to be measured by some agreed-upon criteria. Evaluation could be based on the satisfaction level of people experiencing the problem situation and on their agreement that an improvement has occurred. Not only is it to be measured by practical outcomes but by a readiness of people to agree that it has provided them with valuable insight. The methodology can be determined as being "successful" if a suitable structure for debate resulted, rather than a created recipe for efficient action. Outputs generated by people using soft systems methodology affect change in situations and create new knowledge. The methodology is useful if it 1) can be applied to real-world problem situations, 2) is not vague but results in purposeful action, 3) is not too precise to limit insight and 4) allows for the addition of new systems thought and techniques.

Checkland (1981) stated that in order to bring confidence in the methodology, it needs to be tested over time involving a number of experiences. Its "success" at facilitating "improvement" needs to be examined under various circumstances.

Agrotechnology Transfer as a Human Activity System Responding to Farming Concerns

This review highlighted the need for a variety of methodologies for tackling all types and levels of problem situations. This dissertation's research activities involved the application of the soft systems methodology for improving agrotechnology transfer by looking at it as a process responding to real-world farming concerns of small-scale, tree crop farmers in Kona, Hawaii. The agrotechnology transfer process involved a human activity system operated by people who designed, developed, disseminated and used agricultural technologies and information. The soft system analyst worked through a problematic situation with study participants who had different ideas about improved conditions that should be sought, solution paths that should be pursued and measures used to determine success. The farm problem situation was affected by both public and private knowledge and the agrotechnology transfer process responding to farming concerns needed to account for these different types of knowledge. Success of agrotechnology transfer (performance of the system) was affected by differing viewpoints of these people, undertaking and controlling various activities.

Both holistic and reductionist methodologies were needed for responding to tree crop farming concerns in Kona. During the course of the study, problems requiring basic science, technology development, and/or hard systems methodology were identified and channelled to appropriate people/institutions for action. Reductionist-focussed basic and applied science methodologies were determined to be inappropriate for viewing the process of agrotechnology transfer because the context in which the process occurred was a complex, real-world situation. Soft systems methodology was applied for improvement of the human activity system facilitating the agrotechnology transfer process responding to tree crop farming concerns.

CHAPTER III

MATERIALS AND METHODS

This chapter describes inquiry activities (the whats) and techniques (the hows) for each stage of the soft systems methodology as it was applied in Kona from April 1987 to January 1988 for improving the agrotechnology transfer process responding to concerns expressed by two participant groups. One group consisted of randomly selected Kona Farmers Cooperative members - "KFC farmers" and the other group consisted of people involved in the agrotechnology transfer process - "TT group"). The TT group was later examined by its component subgroups: 1) TT farmers, 2) UHMCTAHR extension service and other information sources, and 3) UHMCTAHR research personnel. The methodology's procedure involved finding out (Stages One and Two), thinking about (Stages Three and Four) and taking action (Stages Five, Six and Seven).

Stage One - Becoming Acquainted with the Situation

During Stage One, the analyst became situated in Kona, a rural area of Hawaii where participants expressed tree crop farming and agrotechnology transfer concerns. She 1) identified a suitable research area and focus, 2) became familiar with the research area,

3) identified and contacted participants for interviews, 4) developed information recording mechanisms, 5) obtained relevant background literature, and 6) developed a program (a UHMCTAHR advising structure and financial disbursement procedure) for accommodating the study.

On 1 April 1987, the analyst began research activities by viewing the farming situation without immediately identifying problems that could be subsequently reduced for analysis. She developed rapport with the community by utilizing cross-cultural, personal communications skills including: listening, smiling, nodding approval, asking questions, and using simple words. She noted, but did not comment on, differences in opinion. She was careful not to appear as an "expert" and downplayed the fact that she was a doctoral student. She forwarded queries for technical information to UHMCTAHR research and extension personnel because lack of insurance coverage prevented her from providing technical advice. She relied on the extension agent's advice and counsel for becoming established in the research area.

In order to obtain KFC's membership list for sampling random farmers, she outlined benefits that the study could bring to KFC's General Manager. Because time prevented interviewing KFC's total population (approximately 440-450 farmers), a sample group of ten percent (forty-four farmers) was selected. Another group of people involved in the agrotechnology transfer process responding to farming concerns was identified with assistance from the extension agent. This group included leaders of commodity organizations, research and extension personnel. The analyst initially contacted participants by telephone, briefly described the purpose of the study, and requested their participation. She assigned each participant a number under which all subsequent information was recorded.

The analyst gathered written agricultural information from the extension service, libraries, and state and county agencies. She began writing a daily journal to record decisions necessitated by and outcomes of the procedure, as well as her comments about being a soft systems analyst. All records were kept confidential. During this time a formal procedure, the GRASP program (Appendix A), outlining roles of the analyst, extension agent and UHMCTAHR contact person at Manoa was developed and finalized.

Stage Two - Describing the Situation

During Stage Two, the analyst 1) undertook in-depth, on-site discussions with participants and recorded their concerns and opportunities regarding farming in Kona, 2) organized concerns according to differing viewpoints, 3) identified issue-based and primary-task type concerns, 4) compared the magnitude of the concerns with Industry Analysis Program bottleneck priorities, and 5) reviewed and summarized background information.

The analyst recorded and tried to make "sense" out of why participants viewed things the way they did (e.g. they had a different set of values or education level) even when she personally disagreed with viewpoints encountered. She did not attempt to describe things in modeling terms and did not identify the existence of particular "systems". She avoided analyzing the situation by describing systems properties (e.g. subsystems, boundaries, etc.) which implied interconnectivities that may or may not have existed (p. 36). She thought systemically (e.g. noting communication and control patterns, organizational interactions, etc.).

When the analyst met participants, she informed them of her role and that their anonymity would be protected. She did not lead discussions, rather she listened as participants shared information. She took notes to collect, organize and present information. She employed mind mapping, developed by Buzan (1983), as a technique for recording exact word phrases (nouns, verbs, and colorful adjectives) used by participants. She noted any sense of unease in the situation characterized by participant word choice, gestures, and innuendos.

The analyst drew cartoon-like mind maps in order to combine information contained on several individual mind maps. By reviewing individual mind maps, she identified themes of concern and organized them by participant viewpoints (randomly selected farmers, farmers in the technology transfer group, extension service and other information sources, and researchers) on composite mind maps. She counted the frequency that each theme of concern was mentioned on individual mind maps in order to evaluate how critical it was to people in the problem situation. She classified themes of concern as issue-based or primary task oriented (p. 35). A brief informal questionnaire was developed and used to collect participant demographic and crop information (Figure 4). After each interview, she wrote a "farmer profile" consisting of one to two paragraphs describing each farmer's background and viewpoint about their farming situation and the agrotechnology transfer process.

Participant Number ____________

	Coffee Acres		Macadamia Nut Trees	Avocado Trees
How Much Crop				
Expected Price				
Expected Harvest Time				

	≤ 5	5–10	≥ 10		
Years Living in Kona					
	Males	Females			
Number of Workers On-farm/On-site Off-farm					
	≤ 30	30–50	≥ 50		
Ages					
	J	C	P	F	M
Ethnic Background J = Japanese C = Caucasian P = Portuguese F = Filipino M = Mixed					
Agricultural Training/Education					

Figure 4. Participant Demographic and Crop Questionnaire

At the end of Stage Two, the analyst prepared a report, referred to as a "rich picture" (pp. 31-32). Its major components were analyses of structures, processes and climates associated with themes of concern expressed by participants (pp. 34-35). Rich picture descriptions were verified through subsequent discussions with participants and on-site observations. Original versions are not reported herein due to their frank accounting of people's feelings about farming concerns and activities influencing agrotechnology transfer in Kona. During the ten-month study, the analyst wrote updated versions of the rich picture as changes occurred.

The analyst read, summarized and included published background information collected during Stage One in a written piece outlining Kona's farming situation during 1987-88 (Appendix B). She also included statistical background information in this section of the rich picture.

<u>Stage Three - Envisaging Improved Situations</u>

During this stage, the analyst lead participants in thinking about possible improvements. She 1) engaged participants in discussing possible improvements for concerns that they determined were important, 2) recorded key transformations (functions) that were needed and embodied in the improvements, and 3) developed root definitions that concisely defined components of each improvement. Focus of this stage was on envisioning what the future could be rather than outlining actual steps (how) to get there.

In order for the analyst to be prepared to assist participants in viewing needed human activities, she developed practice transformation statements for each theme of concern identified in State Two. Then she revisited as many participants as she could (75% of the randomly selected KFC farmers and 96% of the people actively engaged in agrotechnology transfer) and discussed improvements they envisioned should occur. Discussion began by reviewing the composite mind maps that illustrated themes of concern identified during Stage Two. Participants were then asked to choose which concerns were most important and in most need of improvement. They also were encouraged to add new themes of concern not previously recorded. Then the analyst asked them to describe how the improvement would appear and what functions (activities) would be occurring in their visions in order for participants to feel less concerned about the themes mentioned during Stage Two interviews. The analyst recorded participant relevant system statements (p. 32) describing possible improved activities.

Complete statements about contexts in which transformations should occur, root definitions, (p. 32) were developed using a technique, CATWOE (Smyth and Checkland, 1976). The analyst used CATWOE for gathering the following information from participants:

1) Customers (C) - who might benefit or be affected adversely if an improvement were actualized,

2) Actors (A) - who would be responsible for carrying out the activities envisaged in the improvement,

3) Transformation (T) - what would occur in an improved situation (what was desired; what would be happening as inputs were transformed into outputs),

4) Worldview (W) - why would this improved condition be considered important,

5) Owners (O) - who would have the power to hinder or help facilitate the T,

6) Environmental Constraints (E) - what factors (limitations) might affect the situation.

Transformations outlined activities and were described with verbs. The analyst spent considerable time with participants finding specific verbs which they believed accurately described desired activities. She was careful not to lead discussion, but rather recorded only what participants said. She asked questions to clarify the participant's vision but did not formulate improvement statements herself.

After interviews were finished, the analyst tabulated the number of times a theme of concern and transformation statement were discussed. Three themes of concern mentioned most frequently by the entire group of participants were examined more closely by two subgroups of participants in order to reach agreement on what verbs most accurately described desired functions. Fifty-four percent of the participants mentioned two concerns together so a joint improvement statement was developed for these two concerns. Subgroup participants that assisted in formulating Stages Three, Four, Five and Six outputs were composed of: 1) those mentioning the themes of concern as most critical during Stage Three's interview, 2) commodity organization leaders, 3) a representation of the community's ethnic groups and farming types (old timers, children of old timers, and progressive new farmers), and 4) available UHMCTAHR staff.

Stage Four - Developing Improved Situation Models

Stage Four organized Stage Three's relevant systems and root definitions into conceptual model form (pp. 32-33). During this stage, the analyst revisited each Stage Three subgroup participant, discussed subsystem activities and moved on to the next participant. Often new ideas or approaches prompted her either to return to previously visited subgroup participants or to wait until Stage Five and Six, when she revisited all the participants. She tried to arrange joint meetings with two or more participants in order to create a brainstorming atmosphere.

The analyst listed T's from Stage Three's CATWOEs by worldview, order (logical way to fit activities together) and hierarchy (some activities were broader, more encompassing in scope than others). She separated each transformation suggested by participants by level of importance, resolution or activities for subgroup participants.

Subgroup participants carefully examined verbs chosen by participants for relevant statements developed during Stage Three. These verbs were used for determining the character of models developed for facilitating joint thought, visualization and discussion about what improvements could exist. Resulting models illustrated human activity systems which could undertake the minimum number of activities necessary for producing desired transformations (T's). Transformations associated with reaching improvements were distinguished as <u>whats</u> from <u>hows</u>. Subgroup participants identified and organized the major transformation (the desired what) for each system, those subactivities (subsystems) needed to actualize the major transformation, and their sub-subactivities (subsubsystems) for undertaking the subsystems. The "hows" were later incorporated into proposals for change during Stage Six. Inputs were identified that could change via the transformation process to outputs, lines of authority and information flow.

The analyst utilized the following ten point set of ordered activities developed by Wilson and Morren (1989) for leading the subgroups in completing Stage Four's models.

1) At the onset, a clear statement of what transformation was desired was determined. Then human activities needed to do that transformation were identified and stated as action words (verbs) arranged in a logical order. Naughton (1984) suggested the fewer activities the better because the goal was to determine the minimum number of activities needed to achieve a function. Backup activities needed to support the primary activities were identified; activities which had common functional points were combined.

2) Some activities were subordinate to other activities and were separated by their level of resolution. Each model had a hierarchal structure and each subsystem had all the characteristics of larger systems.

3) Then inputs (resources) necessary for the functioning of each subsystems were specified.

4) Outputs of each subsystem and the total system were then tallied.

5) Boundaries of the system and subsystems were then determined based on who had authority to control each subsystem's activities.

6) System performance measures were determined.

7) Decision making processes were determined.

8) Constraints imposed by the environment that affect the system were specified.

9) The system model was then checked against Checkland's (1981) formal systems characteristics to ensure that no detail was missing.

10) The model was presented to those who helped develop it for comment and amendment.

The analyst prepared written descriptions of two improvement models. She compared the models' components with the list of formal system guidelines (pp. 23-24) needed in order for it to be conceptually a formal systems model.

The analyst later reexamined themes of concern mentioned during Stages Two and Three and determined what information was lacking. She identified other methodologies (basic science, technology development and hard systems analysis) that would be useful for addressing some of the concerns and discussed them with key participants and agrotechnology transfer policy makers.

Stages Five and Six - Comparing the Improved Situation Models with the Actual Situation During 1987-88 and Debating Proposed Changes

These two stages were undertaken simultaneously. At the beginning of Stage Five, the afore-mentioned subgroups reviewed and updated the situation which had changed since Stage Two when it was originally described. New actors who might be able to assist in the improvement process (reviewing envisaged future activities, suggesting realistic proposals for change, and implementing changes) identified themselves or were identified by participants and the analyst. Confidential discussions with the analyst brought them through Stages Two, Three and Four. Because this study occurred in a real-world setting and participants continue to pursue the proposals for change, identity of these key players can not be reported herein otherwise success for achievement of the participants' proposals might be jeopardized.

The analyst recorded information provided by the subgroups by having them complete question generation tables (modified from Wilson, 1984 by Wilson and Morren, 1989). These tables showed if model activities existed during 1987-88, how their performances were measured and proposals for improving them.

The analyst then revisited as many participants as possible (70% of the KFC farmers and 79% of the TT group) to compare what was with what could be. Participants examined possible improvements (Stages Three and Four), based on the problematic situation as described in Stage Two's rich picture. By examining activities presented in Stage Four's models, participants discussed if and how the activities occurred during 1987-88 and; how the activities' performances were measured (p. 33). They completed the question generation tables, added new information, discussed each activity, and suggested proposals for improving current activities. During Stage Six, participants debated if these proposals were culturally, organizationally (structurally), technically and/or economically feasible and desirable. The analyst mind-mapped each participant's verbal response to each proposal. Favorable and unfavorable (or "with reservation") responses to the proposals were presented as percentages for those verbally responding.

Outcomes of Stages Five and Six included two refined human activity system models addressing 1) an improved agrotechnology transfer process responding to Kona's farming concerns and 2) coffee marketing and quality concerns. Participants discussed the nature of changes that were implied by the models with the analyst. A record of Stage Six's debate provided community leaders with documentation for supporting feasible and desirable proposals when they pursued implementation during Stage Seven.

Stage Seven - Implementing Changes

Stage Seven activities were not envisioned as part of this doctoral research because they involved implementation of those changes deemed feasible and desirable resulting from Stage Six's debate. The analyst, however, found it impossible to terminate her involvement from the situation and agreed to assist participants in developing a plan for pursuing changes. She worked with a subgroup of study participants (leaders of Kona's tree crop commodity organizations) who 1) contacted additional community leaders needed to draft a strategic plan, 2) formulated a strategic plan (p. 34), and 3) pursued steps to implement the plan. Tree crop commodity organization leaders met with farmers to discuss the proposed strategic plan. The plan of action included determining 1) which proposals were most critical and likely candidates for action, 2) mechanisms by which the community would suggest changes, 3) who would have the power to assist in obtaining the suggested changes, 4) what positive forces (socio-political) could be marshalled to assist the effort, and 5) if and when the action would be completed. Since the proposed changes involved UHMCTAHR, leaders of the tree crop commodity organizations decided that cooperation was needed at a higher level of staff (administrators and policy makers) than what the study had involved. The group developed a contingency plan that included steps to take if the original plan was not acceptable to UHMCTAHR administrators.

B. Identifying and Contacting KFC Participants

The first obstacle encountered by the analyst was obtaining a random sample of Kona's farmers. A master list of the area's farmers did not exist; several farm organizations supplied her with their membership lists. The analyst chose to sample from KFC's membership list because it was the largest farm organization in Kona. In order to use the KFC list, the analyst pointed out in a letter to KFC's manager 1) the study's advantages and 2) that names on KFC's membership list would remain confidential. The analyst never physically took the list into her personal possession. All sampling was done at the KFC's headquarters with the assistance of the KFC field representative.

On 12 May 1987, sixty names were taken at random from KFC's master list of approximately 450 members with the intention that at least forty (10% of KFC's total population) would be willing to participate in the study. Four samplings were required over the next two months in order to secure forty-four participants. Ninety-eight names were drawn to secure forty-four participants because: 1) farmer listings were incorrect (22%), 2) farmers were too busy or not interested (14%), 3) people were no longer engaged in farming (9%), 4) relatives were already participating (5%) and 5) 4% could not be reached.

At the suggestion of the extension agent, the analyst began by calling farmers that the agent knew would be cooperative so that her first experiences would be positive. The extension agent listened as several of the phone calls were subsequently made. During these calls, the analyst explained who she was (a graduate student in Agronomy and Soil Science Department at UH Manoa) and that she was interested in talking to farmers about their concerns. She then asked if they were still farming. Some participants initially tried to talk the analyst out of meeting with them by saying that they did not have any problems or that they were only part-time farmers. The analyst responded to this by saying that this kind of information was important when considering how to assist farmers, because, if technologies and information were developed with the assumption that people were engaged in full-time farming, they may not be useful or economical for part-time farmers. If they agreed to meet with the analyst, she requested specific instructions as to how to get to their farm.

Five participants spoke at great length on the phone. They were not interested, however, in on-farm visits so mind maps were constructed during these initial telephone interviews. The analyst was unable to subsequently contact these participants.

C. Identifying and Contacting TT Group Participants

The extension agent also assisted the analyst in identifying TT group participants. Twenty-three people were initially identified as instrumental in transferring agrotechnology and information concerning macadamia nut, coffee and avocado production, processing and marketing concerns in Kona. This group included nine UHMCTAHR faculty and on-site staff working with these crops in Kona. Two additional UHMCTAHR staff were added during Stage Three as team participants because their work proved essential to the study based on concerns mentioned by participants during Stage Two's interviews. Kona TT group participants were identified because they were community leaders actively participating in commodity organizations. At least three participants were selected from each of the three commodity organizations (Kona Coffee Council - KCC, Hawaii Avocado Association - HAA, and Hawaii Macadamia Nut Association - HMNA). Some participants in the random KFC sample were also engaged in TT group functions. The analyst also interviewed KFC and Pacific Coffee Cooperative (PCC) staff members and three independent coffee processors because they distributed farm inputs at reduced rates to their producers and had extensive informal communication links in the community.

D. Developing Information Recording Procedures

Because the study was a first attempt at applying the soft systems methodology in the field of agronomy and soil science, decisions were made and recorded by the analyst in a written journal. In order to ensure confidentiality, each participant was assigned a number under which subsequent information was recorded. The analyst was careful not to identify individual participants when discussing research findings.

E. Obtaining Background Information

Census information was obtained from the UH Hilo (UHH) library. The analyst outlined state and county statistics and planning documents at the Kailua-Kona library. She purchased a draft of the Hawaii County General Plan from the State Planning Department office in Kailua-Kona.

F. Developing a Formal Structure to Accommodate the Study

During Stage One, administrative procedures were formalized which resulted in the development of the GRASP program. Because the study involved the extension agent and was based out of the Kainaliu (Kona) office, a written document stating the roles of the analyst, extension agent and UHM faculty member was developed (Appendix A). The analyst assisted the Kainaliu extension office by answering the phone, referring queries to other UHMCTAHR staff and delivering plant and soil samples to the airport while the extension agent was on vacation and sabbatical for seven months during 1987-88.

Stage Two - Describing the Situation

During Stage Two, the analyst developed a rich picture of Kona's farming situation by attending meetings, interviewing participants, administering a questionnaire, and reviewing background documentation. She summarized participant demographic and production statistics, farming situations, and agronomic and regional information. She identified the structures, processes and climate characteristics of Kona's tree crop farming community; and described participant themes of concern by worldviews, classified them as primary-task or issue-oriented, and examined their relative importance as compared with Industry Analysis Program (IAP) bottlenecks.

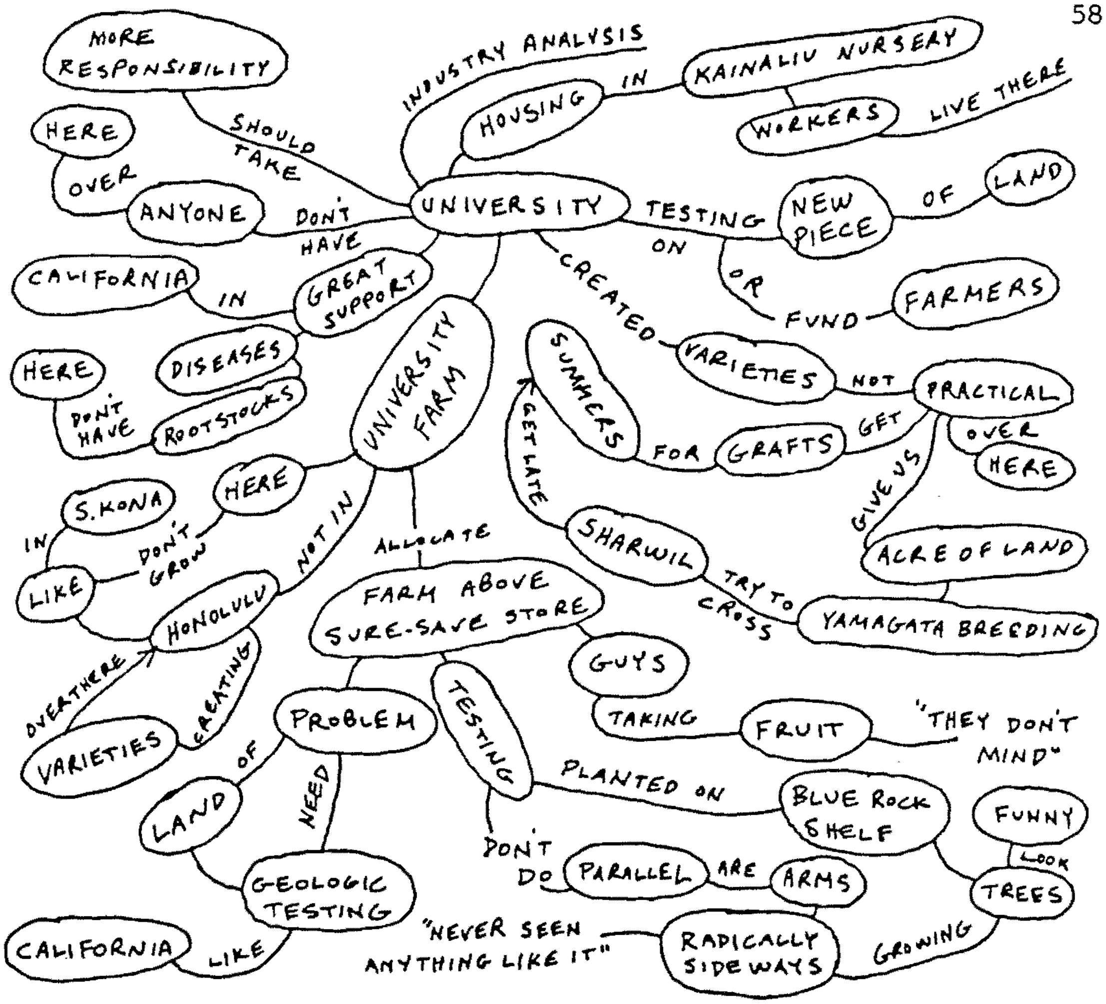
A. Initial KFC Farmer Interviews

Upon arrival at a farm, the analyst looked for something to start conversation: a picture, the weather, a tree, a dog, etc. This initial icebreaker set the stage for a very informal discussion, referred to locally as "talking story". The analyst informed participants that their identities and their conversations would remain confidential. She administered the demographic and production questionnaire during the discussion. Some farmers mentioned that they had expected such a survey and most were able to provide answers quickly to the questionnaire. Mind mapping was employed as a technique to record what participants said to the analyst. Each evening the analyst produced "cleaned-up" mind maps by redrawing them. Participant numbers were assigned to them to ensure confidentiality. An example of a mind map and its narrative is presented as Figure 5.

Some days the analyst scheduled four interviews, however, three proved to be an optimal use of time and helped retain her voice. First interviews lasted approximately one to one and a half hours. The analyst jotted down impressions about participants after each interview and subsequently wrote a series of farmer profiles which were not included here because participant confidentiality would be breached. Participant statements revealed varied personalities, lifestyles and perceptions of the Kona farming community. Some people were not conversationalists, therefore, the analyst sometimes asked broad production questions to initiate discussion. This provided the analyst a basis for understanding farming practices most commonly employed in Kona.

B. Initial TT Group Interviews

The atmosphere which prevailed during interviews with UHMCTAHR personnel was more formal than with the KFC farmers and Kona TT group participants and centered around the projects with which each staff member was engaged. Most of these interviews were conducted at participant offices. The analyst found this information helpful to understanding horticultural and marketing projects being undertaken by UHMCTAHR to alleviate bottlenecks identified via the IAP. UHMCTAHR staff pointed out that UHMCTAHR had to have a broad view for the future and could not be guided by specific problems that might arise during a



"The University should take more responsibility. They don't have anyone over here (in Kona). There's great support in California with diseases and root stocks, which we don't have here. There's housing in Kainaliu nursery for workers to live there. Testing should be on a new piece of land or fund farmers to do it. The University uses the industry analysis and have created varieties that are not practical over here. They need to get grafts for summer (varieties) and give us an acre of land for breeding Yamagata (a summer variety) to try to cross with Sharwil (a good winter variety) to get summer varieties. They need to establish a University farm here, not in Honolulu because things don't grow there like in South Kona. Over there in Honolulu they're creating varieties. The University has land allocated at a farm above the Sure-Save store but these's a problem with the land needing geologic testing like in California. Guys are taking fruit but they (the University) don't mind. They don't do testing there. The trees are planted on blue rock shelves so they grow funny, radically sideways and the arms are parallel. I've never seen anything like it."

Figure 5. Example of Mind Map and Narrative

given season. Some UHMCTAHR staff stated that they were doing their part in responding to the needs of each industry and five stated that farmers should take more responsibility in communicating their concerns to UHMCTAHR via established procedures (e.g. the IAP). Three expressed dismay that IAP procedures did not allow UHMCTAHR staff flexibility to pursue topics that they felt were pressing. Most complained about funding shortages and the need for more help to expand activities. Some stated that they would like to do more for Kona, however, lack of resources and geographical separation between Honolulu and Kona limited this.

The analyst recorded her various impressions of UHMCTAHR personalities in her personal journal. She noted that some staff were down-to-earth and dedicated, however, others appeared pious and condescending. These impressions were verified by the analyst by listening to members of the commodity organizations describe UHMCTAHR staff with which they worked.

Interviews with members of commodity organizations proved to be most forthright of all initial interviews. Some of these participants stated that UHMCTAHR assistance was geared toward farming operations that were larger-scale and more efficient to work with rather than those typical of small-scale farmers in Kona. They voiced concern that Kona was physically separated from Manoa or Hilo, and that this limited UHCTAHR assistance.

After discussing TT participants' concerns, the analyst sometimes brought up the main concerns mentioned by KFC farmers to ascertain this groups' reactions. Those in the commodity organizations usually sympathized with the concerns of the KFC farmers. UHMCTAHR staff either dismissed the concerns as insignificant or requested additional information about what the analyst was learning during the interview process.

Most TT group participants were given the participant demographic and crop questionnaire during this stage, however, four participants were surveyed at later soft system stages because the questionnaire was not fully developed during the time of their first interview. Information was verified during the time of the dissertation write up.

C. The Rich Picture

1. Results of the Demographic and Production Questionnaire

Production statistics for KFC farmer and TT group coffee acreage, macadamia nut trees, and avocado trees are presented in Table 1. Originally, the analyst had planned to collect macadamia nut data in acres, however, after eight interviews, she found that farmers in Kona quantified their macadamia nut production units by number of trees. Data originally collected in acres were recollected by the number of trees during Stage Three's interviews.

Figures 6 through 13 graphically illustrate the results of the participant demographic and crop information questionnaire for both groups. Although the majority of both groups had resided in Kona for a over 10 years, 28% of the TT group had resided fewer than five years in the study area. All of the farmers from the KFC group had resided in Kona more than five years. The majority of the KFC group on-farm workers (55%) were over fifty years of age. The majority of the TT group workers engaged on-site (66%) were between the ages of thirty and

Table 1. Participant Production Statistics

Crop	KFC Farmers	TT Group
Coffee		
Total Acres	203.10	52.05
Average Acres	4.62	3.25
Median Acres	2.00	0.10
Range	0-47.00	0-25.00
Macadamia Nut		
Total Trees	8800.00	2943.00
Average Trees	200.00	183.94
Median Acres	112.50	7.50
Range	0-1500.00	0-750.00
Avocado*		
Total Trees	1098.00	5613.00
Average Trees	24.95	350.81
Median Trees	7.00	2.50
Range	0-400.00	0-3000.00

*43 KFC farmers reporting

fifty. Both groups reported more males (59% KFC farmers and 67% TT group) than females involved in on-farm or on-site work activities. Ethnicity was recorded for each participant interviewed or, in the case of team participants answering together, for the one supplying the majority of the answers. KFC farmers tended to be of Japanese ancestry (68%) while the TT group tended to be Caucasian (67%). Other ethnic groups included people of Filipino, Portuguese and mixed decent.

Originally it was intended to collect information about agricultural training (education level); early in the interview process, however, it became apparent that KFC farmers were not forthcoming with this information. The analyst also attempted to record perceived future expected market price and harvest time for the

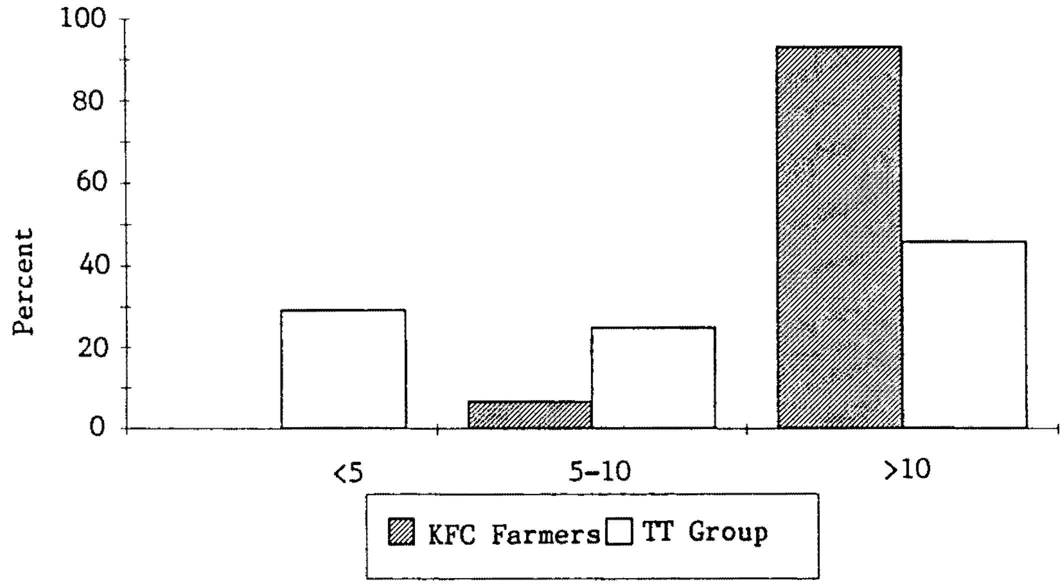


Figure 6. Participant Years in Kona

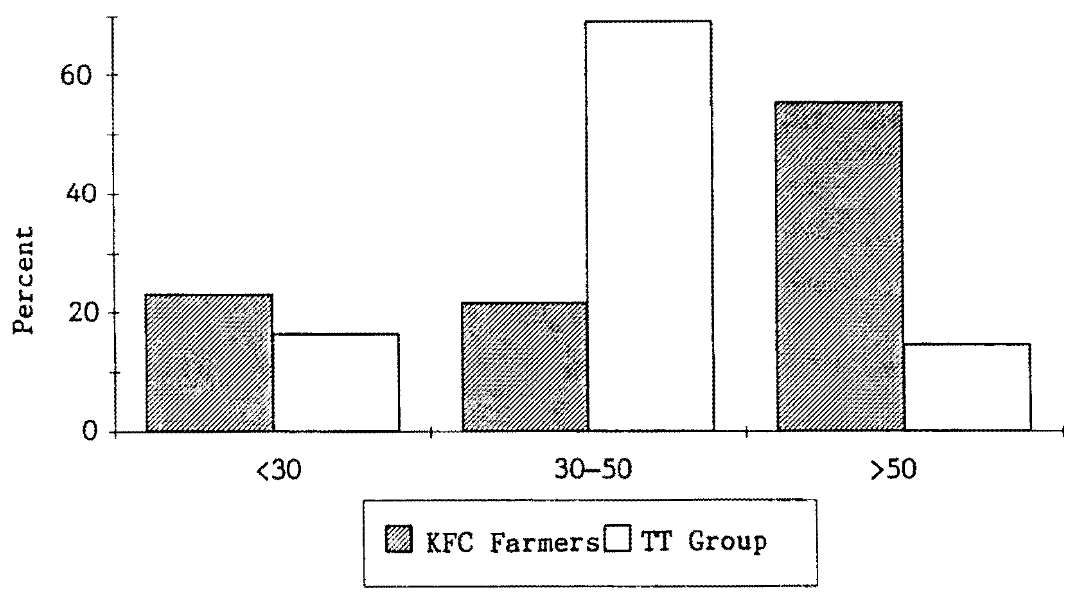


Figure 7. Age of Workers

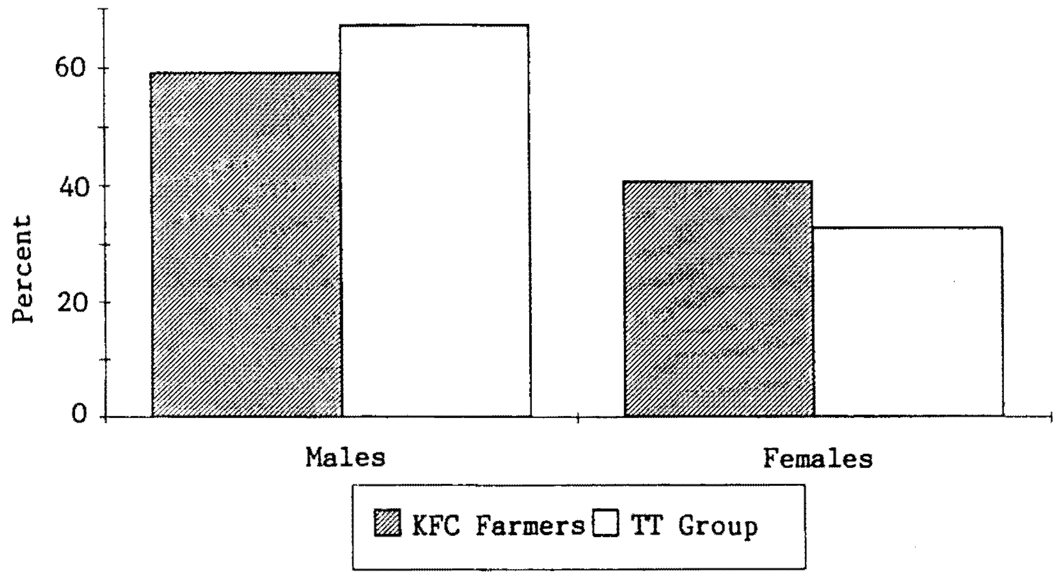


Figure 8. Sex of Workers

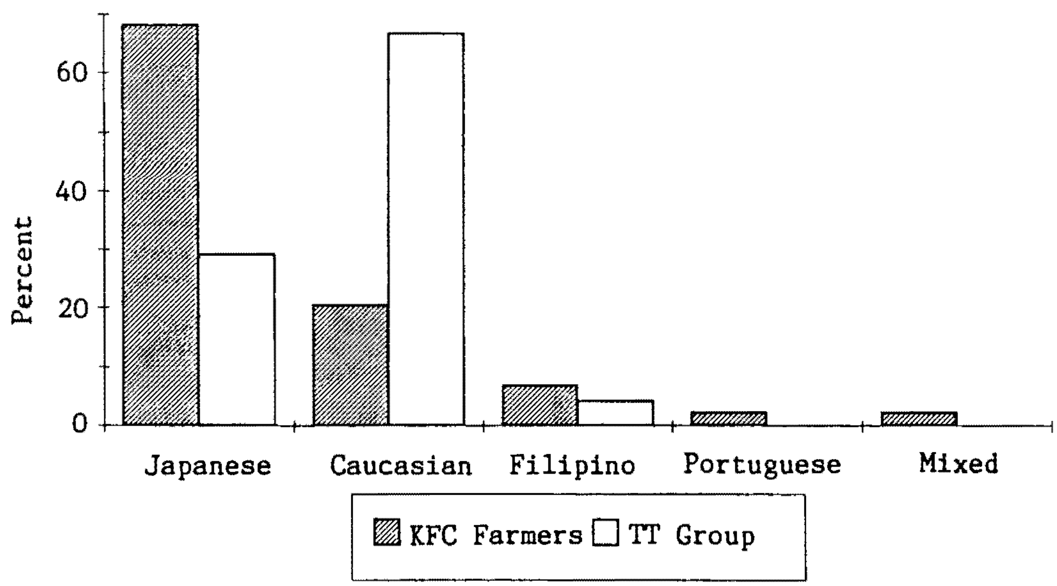


Figure 9. Participant Ethnicity

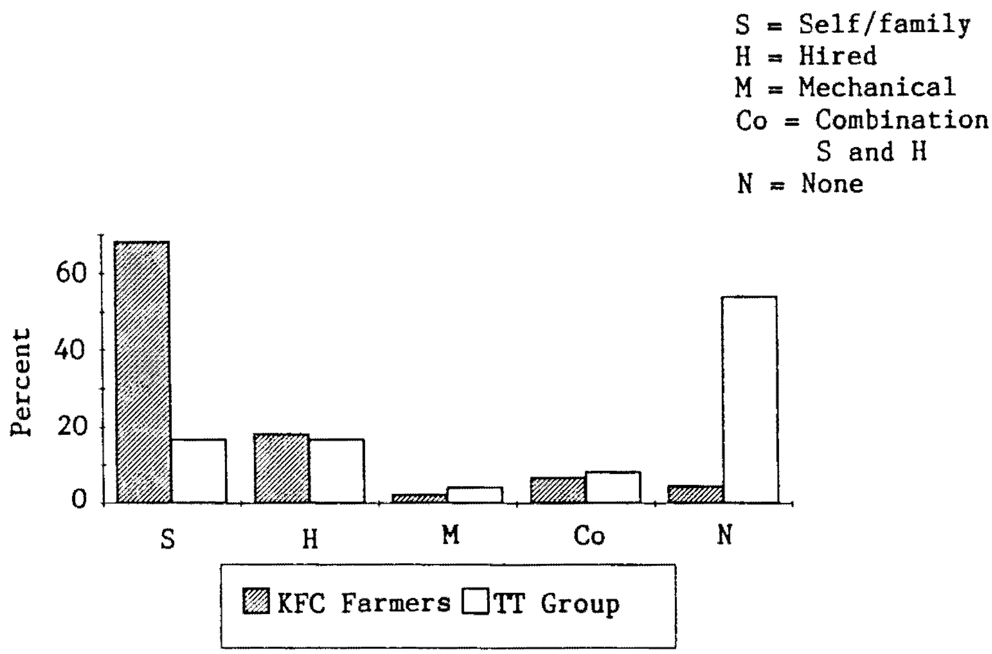


Figure 10. Sources of Coffee Harvest Labor

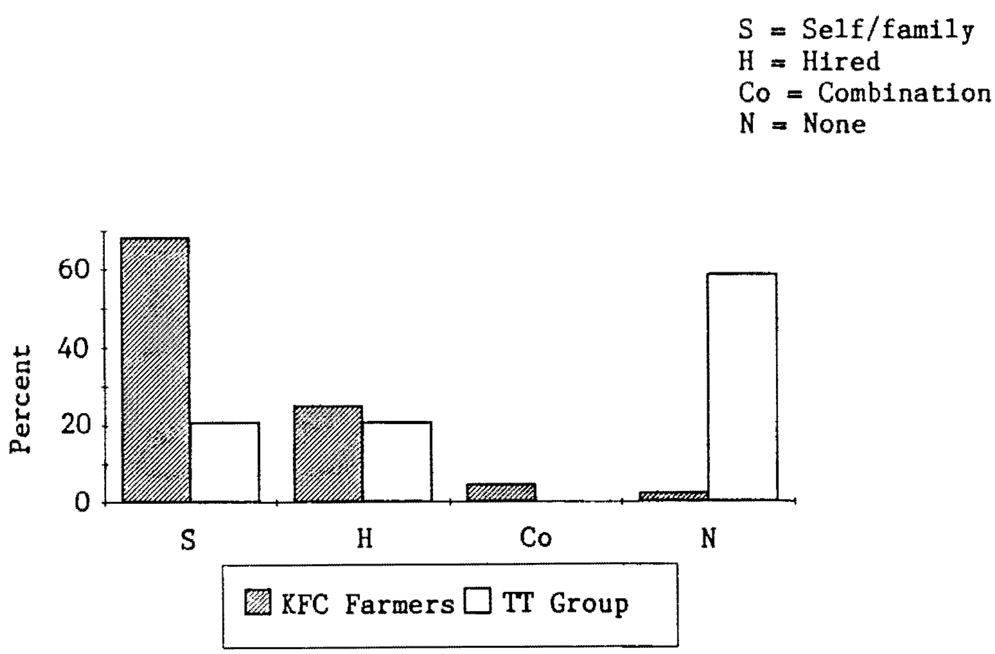


Figure 11. Sources of Macadamia Nut Harvest Labor

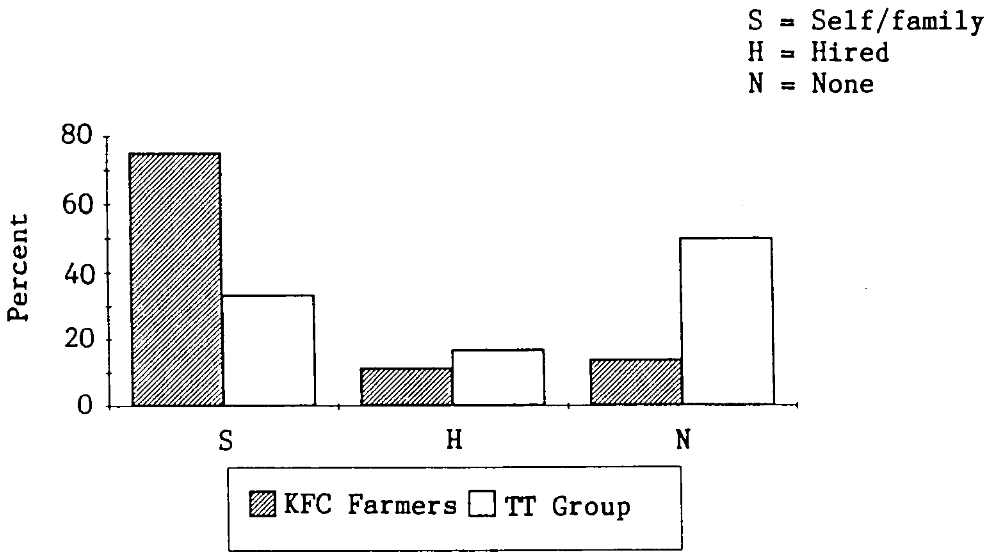


Figure 12. Sources of Avocado Harvest Labor

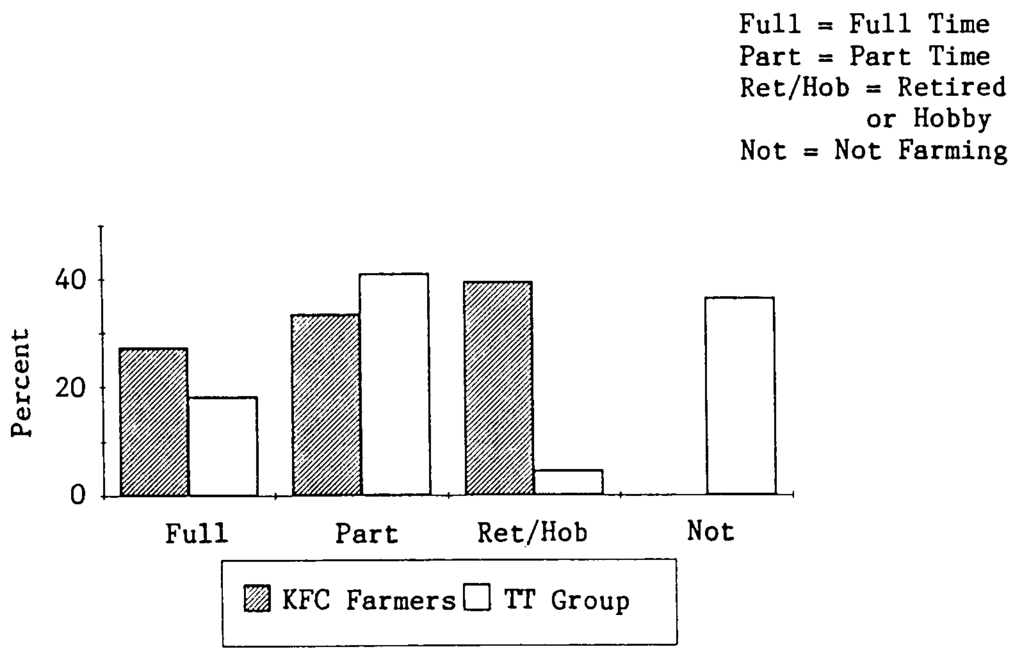


Figure 13. Participant Farming Status

three commodities but found that most participants were unable or unwilling to answer. The analyst found that ascertaining the number off-farm workers was difficult because farmers raised questions pertaining to how much off-farm work constituted an "off-farm" worker. Some farmers appeared reluctant to discuss their off-farm work activities.

The analyst was alerted by several TT group participants that harvest labor shortages were expected so she asked questions pertaining to where such labor was obtained. Figures 10 - 12 show that the labor pool for the majority of KFC farmers consisted of themselves and family members. Sixty-eight percent reported harvesting coffee and macadamia nuts themselves or with help from family members and 75% reported that they harvested avocados. Some members of the TT group stated that they often hired labor and were concerned about Kona's shrinking agricultural labor force.

Through this first questionnaire the analyst became aware that many people were not fully engaged in farming as a sole activity. Over 50% of the TT group did not harvest coffee, macadamia nuts or avocados. Many of the TT group (especially those employed by UHMCTAHR) were not farmers at all, therefore, during Stage Three's interviews the analyst asked seventy-five percent of the KFC farmers and ninety-two percent of the TT group about their farming status (Figure 13). Although all the KFC group considered themselves engaged in farming, 39% responded that they were retired or hobby farmers, 33% as part-time farmers and 27% full-time farmers. Many KFC farmers were retired members of the community; younger farmers tended to be employed elsewhere, especially in the tourist industry. Examination of TT group data showed that it was composed of 36% non-farmers, 41% part-time farmers, 18% full-time farmers and 5% retired or hobby farmers. TT group data showed that this group was composed of UHMCTAHR personnel and younger participants and more likely to be engaged in off-farm employment than older KFC farmers.

Through her interviews, the analyst became aware that the majority of KFC members did not grow avocados commercially, but grew them for home consumption.

2. The Kona Farming Situation

During Stage Two's interviews, participants provided two types of information pertaining to 1) practices associated with the production, processing and marketing of coffee, macadamia nuts, and avocados and 2) farming concerns and potential opportunities for improvement. The analyst illustrated both types of information by first making a cursory pass through the individual KFC farmer mindmaps to organize it into one non-specific and three commodity-specific modified "cartoon" type drawings. Figure 14 describes information at a general level that transcended individual commodities. Three commodity-specific drawings pertaining to coffee, macadamia nut, and avocado production concerns were developed, however, were not presented here because their information was presented on other composite mind maps that follow which are discussed in detail (pp. 88-117 and Appendix C).

The analyst identified three types of KFC farmers: "old timers", "children of old timers" and "progressive new farmers" (Figure 14). Old timers tended to have lower education levels, tended to be loyal to

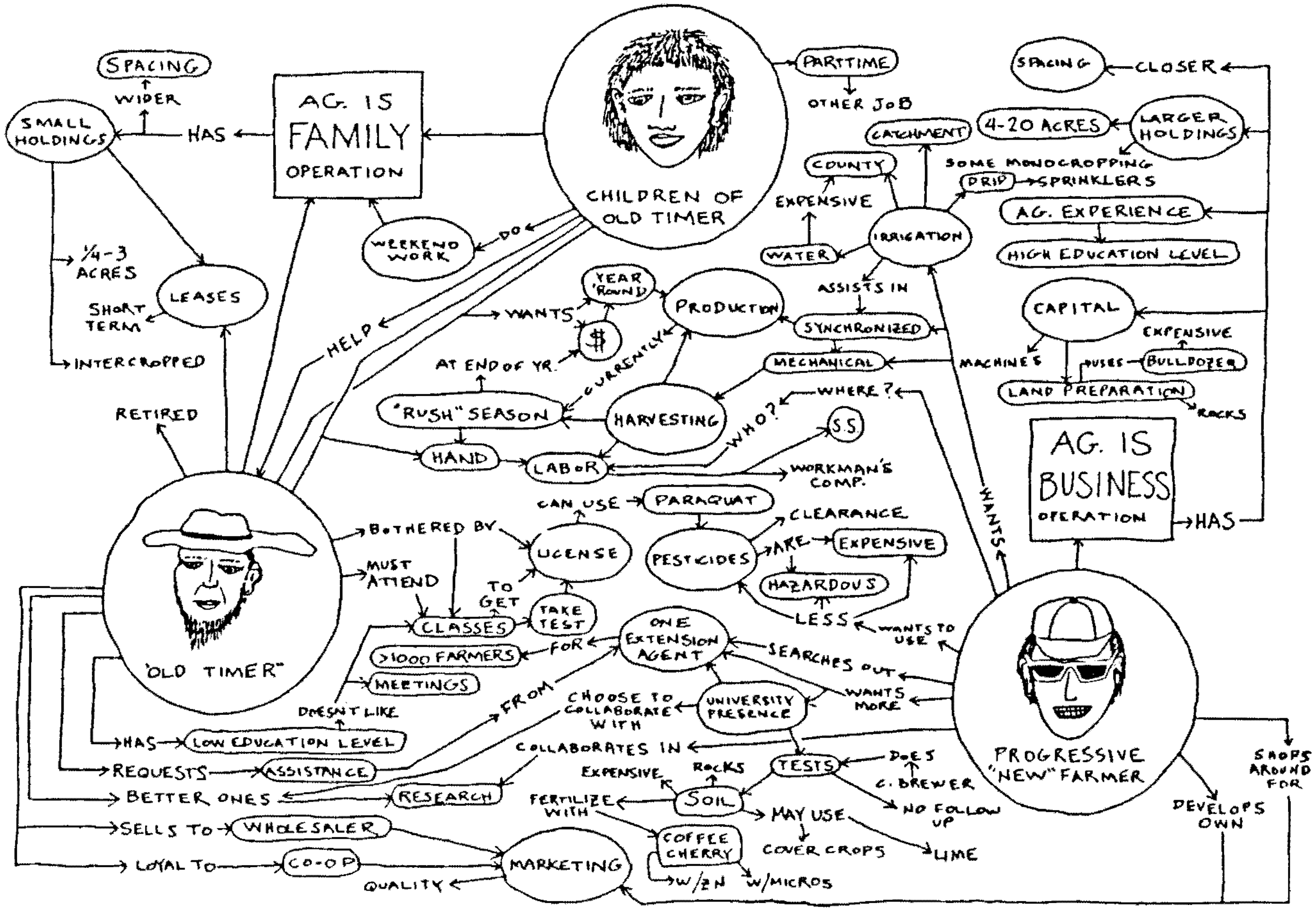


Figure 14. Kona Farming Situation

KFC, could be farming leasehold lands, often were retired, and had small farms. Old-timer farmers mentioned that farming for them was a family operation and that many of their families had been farming the same land for three generations. They tended to operate with limited capital and used technologies developed in Kona during the 1940's and 1950's. Most farm operations were done by hand by the farmer and his wife, with limited help from their children. The pace of farming appeared slow, decisions deliberate and reflected values of patience, modesty and cultural community (predominately oriental) interaction.

Children of the old timers also participated as members of family farming operations. Because they often held full or part time jobs in other sectors of the economy (especially the tourist industry), they were able only to contribute weekend and after hours labor. This group was likely to understand some but could not speak Japanese. They told the analyst that most farming decisions were still made by their parents, the old timers.

The analyst found that agriculture was a business operation for progressive new farmers who had 1) spent more capital on farm improvements, 2) higher education levels, 3) larger land holdings than the median acreage, and 4) often agricultural experience from elsewhere. These farmers spoke about new technologies including: mechanical harvesting, irrigation systems, and pesticides (including finding alternatives to chemical controls). They discussed marketing strategies other than belonging to KFC with the analyst. These farmers differed socially and ethnically from the old timers. Many had come to Kona from elsewhere and had no firm ties with their cultural heritage.

Progressive farmers said that they sought out UHMCTAHR extension and research assistance; four instances of collaborative research projects were reported with this group of farmers. The UHMCTAHR soil testing program was mentioned by progressive farmers in conjunction with soil attributes, fertilizer and lime use, rocky conditions and cover crops. Most farmers reported using one fertilizer, "coffee cherry".

3. Summarized Agronomic and Regional Information

Table 2 presents a summary of Kona farmer agronomic practices prepared by the analyst; its accuracy was verified by the extension agent. The analyst wrote a document (Appendix B) that outlined the nature of the Kona farming situation based on a minimum data set suggested at the Kansas State University Farming Systems Symposium in 1986 (University of Florida [Gainesville] Farming Systems Support Project, unpublished).

Table 2. Summary of Agronomic Practices

Practice	Coffee	Macadamia Nut	Avocado
		(Often interplanted)	
Varieties			
	Guatemalan (99%)	Keauhou (246)	Sharwil
	Old Hawaiian	Kau (344)	Yamagata
	Caturra	Ikaika (333)	Ota
	Catuai (on other islands)	Others	Others
Planting Density			
	500–1200/acre	25 X 30 feet 40–80 trees/acre	25 X 30 feet at random

Table 2. Summary of Agronomic Practices[a] (Continued)

Practice	Coffee	Macadamia Nut	Avocado
Propagation			
	Pulapula (pulled seedlings) put directly in soil or in bags for 3-6 months (95%), seedbed nurseries, or seeds started in bags.	Grafted trees are available.	Many seedling trees and grafted trees are available if arranged with nurserymen.
Pruning			
	Multiple vertical Single vertical Beaumont Fukunaga (stump every three years)	Little pruning, but want canopy open for air and light penetration	Little pruning, but should keep at harvestable height
Insects and Diseases			
	Ants Green scale Black sooty mold Termites Soil mealy bugs Nematodes	Koa seedworm Green stink bug Sticktights Dieback Ambrosia beetle	Fruit flies (Mediterranean, melon fly, and oriental) Thrips and mites Phytophthora Anthracnose
Time to Bearing			
	2-3 years	5-6 years	4-5 years
Herbicides[b]			
	Dalapon Goal on non-bearing trees	Dalapon Several preemergent	Several preemergent

[a]Soils are young (Andepts) and quite rocky. One fertilizer formulation (2:1:4 ratio) is applied 2-4 times/yr for all crops. Coffee cherry (10.5.20) with or without Zn, Fe, and Mg is common. 16.16.16 used for new plants. Common soil pH is 4.2-4.8 and generally not enough lime is used.

[b]Roundup, Paraquat and Fusilade cleared for all three crops.

4. Structures, Processes and Climate

The following is a summary of the structures, processes and climate associated with Kona's farming situation written during August 1987 after the analyst completed Stage Two interviews. The analyst described these components of the rich picture based on individual conversations she had with community members and UHMCTAHR staff (most of whom were participants in the study). Structures, processes and climate of Kona's general farming situation are first presented. Following that is a discussion of the general situation and specific structures, processes and climate for the coffee and avocado industries. The analyst gathered this information because she was encouraged to attend KCC's and HAA's monthly meetings and was in close contact (often on a daily basis) with leaders and staff of these industries. She was unable to collect similar information for the macadamia nut industry because she was not invited to attend HMNA's board of director's meetings and not in regular contact with industry leaders. The analyst also drew upon information presented at other community meetings.

a. General Kona Farming Structures

The analyst classified farmers according to their participation in the agrotechnology transfer process: those that participated in extension service and community organizations, (the "engaged"), and those that did not participate, (the "disengaged"). Those engaged vocalized their concerns in the local community and to their legislators. These farmers joined with processors and formed commodity organizations such as the Kona Coffee Council (KCC), the Hawaii

Macadamia Nut Association (HMNA), and the Hawaii Avocado Association (HAA). KCC appeared to the analyst as relatively young but with strong leadership and farmer interest; HMNA was well established and changing since new officers were in charge and HAA was relatively young with 'developing' community leadership and limited farmer participation. Other important organizations identified by the analyst were the Kona Farmers Cooperative (KFC), Pacific Coffee Cooperative (PCC), and the Kona Farm Bureau (KFB). The latter three organizations consisted primarily of older farmers while the first three groups had both older and younger members. Farmers and businessmen who sat on the boards of directors for these organizations were community leaders. KFC's structure consisted of a board of directors elected from and by its members, a general manager, a field representative, office staff and mill workers.

The analyst found that another group of farmers was usually disengaged from the formal process addressing their farming concerns. Some of these farmers couldn't read or write. Some had state and national political influence. Many stated that they didn't attend meetings, yet some complained about services that they received from UHMCTAHR and farm organizations. Many of the disengaged group were retirees or part-time farmers who did not feel that they were part of the 'regular' farming community. They were well-connected in the community through family ties. One organizational structure identified by the analyst in the Japanese community was the Kumiai which consisted of fifteen or so families that once bound together to help each other in times of need, such as death, financial crisis, and overburdonsome manual labor. Kumiais also held social get-togethers. Although historically important, only older farmers mentioned them as community communication and support structures.

Another important facet of Kona farming community identified by the analyst were organic farmers. They were a highly vocal group of newer community members that had relatively recently moved to Kona (within the last ten years). They were concerned about preserving Kona's physical environment and were opposed to using artificial chemicals in agricultural production. They were from all ethnic groups and tended to be more literate. Often they cited Mainland US agricultural publications as their information sources.

Assisting the above-mentioned Kona farming structure was a UHMCTAHR structure. UHMCTAHR personnel that worked directly with crops grown in Kona included: researchers based in academic departments, an extension agent who operated via the county-wide extension service and was based in Kona, and a Manoa-based extension specialist who linked researchers with the extension agent. Researchers were located at either UHMCTAHR on the island of Oahu or at the UHMCTAHR facility at the Beaumont Experiment Station in Hilo. Manoa and Hilo were physically isolated from Kona (168 and 90 miles, respectively). There was one extension agent in Kona to take care of coffee, macadamia nut, and avocado farmers as well as commercial and home ornamental, and fruit growers and processors from Pololu to South Point, a distance of approximately 125 miles. His immediate supervisor was the County Administrator of the Hawaii County Extension Service in Hilo.

Table 3 presents UHMCTAHR research activities related to coffee, macadamia nut and avocado production and marketing that the analyst learned about during Stage Two (April through July 1987). Most activities were undertaken on a part-time basis by three researchers in the Horticulture Department and two researchers in the Agricultural Resource and Economics Department. The analyst learned that most UHMCTAHR researchers were responsible for academic discipline specific research. During September 1987, she learned of an ant control project for pineapple and coffee underway on Oahu, however, activities related to coffee ant control did not began in Kona until January 1988. The analyst learned later of another marketing project focussed on consumer demand for fruit and nut crops, however, researchers did not inform Kona commodity groups about the project until late 1988. She also learned of an avocado post harvest disease control project in late 1988.

b. General Kona Farming Processes

The analyst found farmers in Kona to be outspoken, independent and accustomed to making their own decisions. They had developed commodity and community organizations (structures) to assist them. Two farmer cooperatives (KFC and PCC) had been formed to assist marketing efforts when coffee cherry (unprocessed fruit) prices were extremely low during the 1950's. Two farmers told the analyst that if 1987-88 coffee prices were low, it might help KCC become stronger for the same reason. Leaders of Kona's farm associations tried to represent all the community's farmers, however, they and some UHMCTAHR staff stated that they knew that they represented only the engaged group of farmers.

Table 3. UHMCTAHR Coffee, Macadamia Nut and Avocado Research Foci

Coffee

1. a. coffee cupping techniques (including training cuppers) and testing coffee quality (effects of growing location and different coffee varieties)
   b. examining the effects of holding time on brewed coffee quality
2. coffee nutrition, irrigation, and crop modeling
3. synchronous flowering
4. marketing of Kona coffee
5. state-wide variety trial at eighteen different locations
6. weed control

Macadamia Nut

1. biochemistry (rancidity deterrents and spoilage)
2. synchronous flowering
3. pest control
4. varietal improvement
5. soil fertility

Avocado

1. quality testing to identify superior varieties
2. varietal improvement based on imported selections (Mexican and West Indian)

They expressed interest in the analyst's work as a means of better reaching their constituents. They communicated Kona's farming needs to UHMCTAHR extension service and researchers and relayed information from UHMCTAHR to farmers.

The KFC field representative had responsibility for assisting over 450 cooperative members. He took soil samples and gave advice on technical farming problems. He stated that he could use more specific agronomic information and training to help him understand scientifically the rationale behind his grower recommendations. He wanted to take more agricultural courses at the university level.

UHMCTAHR was responsible for the creation and dissemination of technical information to farmers. Researchers stationed at Manoa and Beaumont visited Kona approximately once a month and had a few on-site experiments. Individual "engaged" farmers worked with the researchers. Day-to-day activities related to UHMCTAHR research projects were undertaken by the staff of the Kainaliu (Kona) experiment station, headed by the station foreman, who was born and raised in Kona and trained in horticulture. Another UHHCA-trained person assisted with the installation and data collection of UHMCTAHR irrigation, nitrogen and variety trials and was hired on short-term project funding.

The extension specialist was responsible for bringing research information from the researchers and other outside sources to the extension agent and farm organizations. The extension agent had responsibility for disseminating this scientific knowledge to over 1500 farmers. He agreed to become part of the analyst's research in order to develop better tools that could improve the process of agrotechnology transfer. The extension agent and analyst operated under the GRASP program guidelines. Their work involved very detailed, daily extensive discussions about the research focus, activities and outcomes. The extension agent accompanied the analyst during most of Stage Two interviews.

c. General Kona Farming Climate

During Stage Two's interviews, farmers mentioned that they needed more assistance from UHMCTAHR. Community members, especially those participating in the commodity organizations, mentioned that they were disturbed that UHMCTAHR funding had been cut, especially for extension-related activities. Farmers stated that one already overextended extension agent was not enough to meet adequately their farming concerns. Engaged farmers requested at commodity organization and community meetings that UHMCTAHR researchers become more involved in Kona's affairs. The analyst observed that this group of farmers complained, was short tempered, impatient, and angry with UHMCTAHR because they stated that their needs were being ignored. The analyst noted, however, that it was these farmers who were receiving the bulk of UHMCTAHR's attention and assistance at that time. Disengaged farmers grumbled (sometimes to politically important people) and made defeatist, negative comments. No formal mechanism existed to identify and integrate them into the sphere of agrotechnology transfer because of their reluctance to attend meetings and to become vocal publicly about their needs. When both groups of farmers were contacted by the analyst, most were outspoken and stated that they appreciated her visiting them to listen to their concerns.

Researchers stated that they visited Kona infrequently (about once a month) because of funding and time constraints. Some claimed that because of budget constraints they had no other alternative but to work with large-scale growers who provided funds for research supplies and travel.

Remarks made by some university staff indicated that there were technologies available to respond to farmers concerns, however, farmers were reluctant to adopt them. The analyst noted that the attitude of some researchers was confident, competent and concerned, however, she heard complaints from farmers that other researchers were standoffish and secretive. One farmer reported that when he asked a researcher a question, the researcher ignored him and walked away. On three occasions it was reported to the analyst that specific researchers would not visit Kona farms unless they were paid as consultants. Because of their job descriptions, on-site farm visits were not required.

On the other hand, several farmers interviewed stated that researchers didn't know what it really was like to farm; that only limited information available to them was applicable to their multiple cropping systems. The analyst noted examples of farmers rejecting UHMCTAHR-developed information including: 1) refusal to start coffee nurseries for a source of healthy seedlings, 2) refusal to apply fertilizer more than two times per year and to adhere to liming recommendations, and 3) refusal to plant trap crops to discourage insect pests.

The analyst noted that relationships among researchers and the Kona extension office and farm organizations could have been stronger. She observed that some researchers did not always inform the extension agent and farm organizations about their research, schedules, visits, etc. Often research decisions were made solely by researchers, with limited input from specific engaged growers and the commodity organizations. On the other hand, the analyst observed that some researchers engaged in active dialog with the extension agent, farm organizations and farmers about planned activities and visits.

Farmers complained to the analyst that research results, including results of trials and fruit and nut scion wood, were "controlled" by researchers. The analyst was told by UHMCTAHR staff that researchers needed to have control of this process because they might have plans for specific stock.

Unfortunately the analyst was unable to discuss her research with the general manager of KFC due to the pressing nature of his job. She scheduled four appointments with him and he subsequently cancelled three of them. She met frequently with KFC's field representative and benefited from his real-life crop production information because he was a coffee grower. The extension agent referred to him as a "bridge" with Filipino farmers because he was Filipino by decent which facilitated communication.

d. The Industry Analysis Program - A State-wide Resource Planning and Allocation Structure

During Stage Two, the analyst became familiar with the Industry Analysis Program (IAP), the formal structure by which state-wide funding was allocated for relieving agricultural commodity bottlenecks. The analyst found a description of the IAP process in Mark and Lucas (1983). IAPs were used to determine commodity industry goals and resulted in specific resource allocation and coordinated agricultural planning. They served to augment information gathered by county agents working day-to-day with farmers for agricultural planners and policy makers.

One of the major IAP tasks was to identify high priority bottlenecks in the following problem areas: land, water, capital, cultivars, disease control, insect control, weeds culture and management, harvest and postharvest, transportation, and marketing and economics. How these problem areas were first defined was unknown to the analyst, however, they served as the focus of inquiry for the coffee, macadamia nut and avocado IAP's examined by her. Each IAP contained a table outlining these predetermined (a priori) problem areas and each identified bottleneck was classified based on them.

Tree crops raised by Kona's farmers had all undergone at least three IAP's. The analyst found no record as to how bottlenecks were identified in the original IAP's for each crop, however, she was informed that they were developed from a series of discussions involving farmers participating in the commodity organizations, extension service and research personnel in the past. Bottlenecks identified in previous IAPs served as the basis for updating new IAPs. Each bottleneck was reviewed as to the progress made to alleviate it by commodity organization leaders and UHMCTAHR staff members. Bottlenecks were discussed later and prioritized by voting at an industry-wide meeting.

Mark and Lucas (1983) pointed out the following limitations of the IAP process: 1) priorities were set on a commodity focus and no mechanism existed to set priorities among industries, 2) funding was not specifically and regularly set aside thus the scope and manpower available to coordinate IAP's were limited, 3) although IAP's were undertaken with cooperation of state agencies, IAP's were not included in the State's Agricultural Plan, 4) as industry priorities were determined by private entities (farmers and businesses), public priorities could have been overlooked, 5) there were no guidelines for soliciting participation from industry members, 6) cross-commodity topics of concern were not adequately handled with a single commodity approach, and 7) often budgetary constraints prohibited undertaking actions outlined in the Action Plan.

The Governor's Agricultural Coordinating Committee (GACC) allocated limited funds for specific research aimed at solving bottlenecks. The GACC had no formal criteria for funding distribution. (Mark and Lucas, 1983). The analyst was informed by UHMCTAHR faculty that there were over thirty or more commodities that competed for a few million dollars under GACC jurisdiction during 1987-88 and it was impossible to support commodities to the highest level. The analyst learned that since Mark's and Lucas' report, extension specialists were given the option to develop projects for obtaining funds specifically earmarked for undertaking IAPs, however, these funds, like most extension funds, were limited (Dr. Ken Rohrbach, personal communication, 1988).

The analyst attended the Fourth Annual Macadamia IAP in March 1987 in Hilo, Hawaii. Prior to the meeting, a UHMCTAHR faculty member in charge of the IAP had prepared a workplan that described the current (1987) and potential status of the industry and identified components of the industry. This was shared with members of the industry for comment and contained a beginning view of bottlenecks, needed actions, agencies responsible for assisting in alleviating the bottlenecks, and what would happen if the bottlenecks were not removed.

An admission fee of $12 was charged by HMNA to anyone attending, even those not allowed to vote on the IAP bottlenecks. Members of the industry (growers and processors) ranked bottlenecks previously identified by HMNA and UHMCTAHR staff by secret ballot. Other bottlenecks could have been written in blank spaces that were provided.

e. Coffee Structures

A description of coffee structures, processes and climate features that were observed by the analyst and verified by participants through the end of August 1987 follows. As time proceeded, concerns related to 1) structures addressing farming assistance concerns, 2) processes controlling coffee ant and scale, and 3) structures and processes to marketing Kona coffee became extremely critical to the coffee industry's survival. These were reported as updates to the rich picture in subsequent soft system stages.

Farmers who originally developed the structure of the KCC decided that its board of directors should consist of six coffee processors and six farmer members. During 1986-87 problems arose between Kona's six processors and two processors withdrew from KCC. The four remaining processor members always sat on the board. Half the farmer members were elected at KCC's annual meeting in May 1987 and the other half was retained from the 1986 board. Initially KCC received funding via the GACC because the #1 bottleneck identified by the 1986 IAP was to hire an executive secretary to coordinate KCC's work. KCC's 1987 budget, including the salary of the executive director (formerly the executive secretary), relied on voluntary assessments paid by the processors on each bag of coffee cherry (unprocessed fruit) collected from farmers. KCC's committees developed plans for industry-wide activities. Some of these committees were: Research and Development, Ways and Means, Promotion, Labelling, Lobbying, and Field Days.

The analyst learned that most of Kona's farmers did not belong to the KCC but were represented by their processor, who was "engaged" in the situation. The analyst found that, aside from two coffee processors who refused to join, KCC was generally recognized by farmers and UHMCTAHR as the voice of Kona's coffee industry. Farmers that participated in commodity group and extension service activities stated that a strong industry-wide voice was needed to stand up to the mounting market competition from business entities on other Hawaiian islands, the Mainland U.S. and foreign countries. KCC was in contact with counterpart coffee boards in foreign countries.

The extension agent and analyst attended KCC board of directors meetings as observers. KCC's executive director contacted the extension specialist and agent directly if she needed information from Manoa or Beaumont researchers and contacted Department of Agriculture (DOA) specialists directly. She regularly attended island and state-wide committee meetings (e.g. the Hawaii Island Development Board) and was in close contact with local and state politicians.

f. Coffee Processes

The analyst observed that decisions were usually made by voice vote of the KCC board of directors. A consensus often had been reached before actual voting occurred due to prior private discussions outside the board's monthly meetings. The executive director did most of the day-to-day work of KCC in consultation with the executive officers. Key activities of KCC's board of directors included: 1) working on a marketing order to ensure funding, 2) marketing, 3) research and development, and 4) lobbying.

g. Coffee Climate

During July 1987, the coffee climate was tense, primarily because coffee processors were not united and KCC funding was not assured. The future of KCC was frequently discussed at KCC's board of directors' meetings because only four processors participated in the KCC and collected farmer assessments. The board developed a budget through March 31, 1988 based on projected income, however, in August 1987 two participating processors were behind in their payments of growers' assessments. KCC embarked on obtaining a marketing order to ensure consistent funding but found that implementation would take at least a year. Until then, the assessment system continued to cause unease because not all processors collected the assessment from farmers.

h. Avocados Structures

The Hawaii Avocado Association (HAA) operated in 1987 via a steering committee consisting of wholesalers and farmers that were elected biannually by the general membership. The industry was young and not formally structured. The analyst was able to identify only four wholesalers. Farmers stated that they had a very personal, individual relationship with the wholesaler who purchased their fruit.

The extension agent and analyst attended monthly meetings of HAA's steering committee. Members of the committee informally discussed issues with DOA on fruit grading and marketing matters. The chairperson of the steering committee corresponded with UHMCTAHR personnel about the specific industry concerns related to extension and research activities. Interested members of HAA had contacted the staff of the United States Department of Agriculture, Animal and Plant Health Inspection Service (APHIS) requesting clearance for shipment of the leading variety, Sharwil, to Alaska.

i. Avocado Processes

HAA published a newsletter every two months which was distributed to its paying and non-paying (past due) members. With the analyst's assistance, HAA developed and submitted to DOA a proposal for funding to develop a marketing program. As an outcome of this exercise, a DOA staff member visited Kona and the HAA president visited DOA in Honolulu and discussed the proposal with its marketing division in conjunction with DOA's state-wide "Island Fresh" promotional program.

j. Avocado Climate

Only a few farmers participated in HAA. The industry lacked unification because avocados were a relatively new commercial crop in Hawaii. Most older farmers contacted by the analyst had a few trees for their own consumption and said that they did not want to market them. A UHMCTAHR fruit evaluation program had had limited success.

The analyst was informed by participants that avocado wholesale buyers were quite competitive and did not seem to be working toward common industry-wide goals. Wholesalers privately discussed common industry-wide concerns with the analyst. They had strong personalities and some stated that sharing information with other members of the industry might reduce their business profits.

Specific avocado themes of concern collected by the analyst from the study's participants are described in Appendix C.

5. Themes of Concern Identified by Worldview and Classified as Issue-based or Primary Task Oriented

The analyst made another pass through the individual mind maps and identified themes of concern. She developed thirteen composite mind maps based on four different worldviews which she identified depending on the role of each participant. Figures 15 and 16 illustrate general (non-crop specific) present concerns discussed by the KFC and TT group farmers. Figures 17-20 present concerns of KFC and TT group farmers, extension service and information sources and researchers related to coffee. Discussion of seven additional macadamia nut and avocado composite mind maps can be found in Appendix C, Figures 22-28. The body of each composite mind map includes an adjective chosen to express the nature of the "climate" of each concern expressed by participants during the interviews. The analyst included an additional adjective on each of the legs of the diagram reporting similar climatic information, although the central idea of the legs was to elaborate on the themes of concern.

The analyst did not lead participants in the interviews, therefore the mind maps reported concerns that participants wanted to discuss. She found that KFC farmers were diverse because various types of concerns and opportunities for improvement were mentioned. She learned that two KFC farmers did not raise coffee, another three raised coffee but were interested primarily in macadamia nut production, and, although most KFC farmers had avocado trees for home consumption, only four raised them commercially.

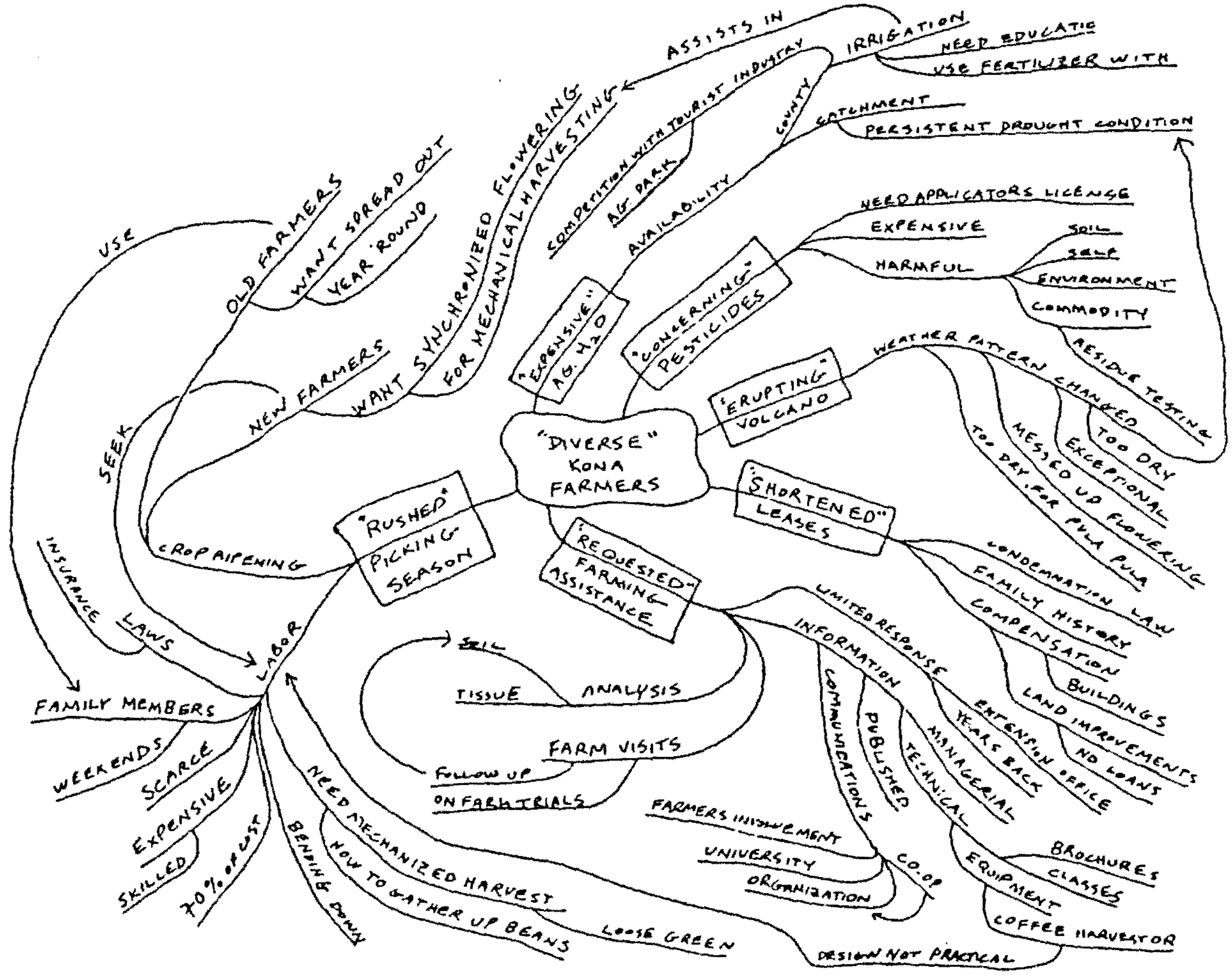


Figure 15. General Concerns of KFC Farmers

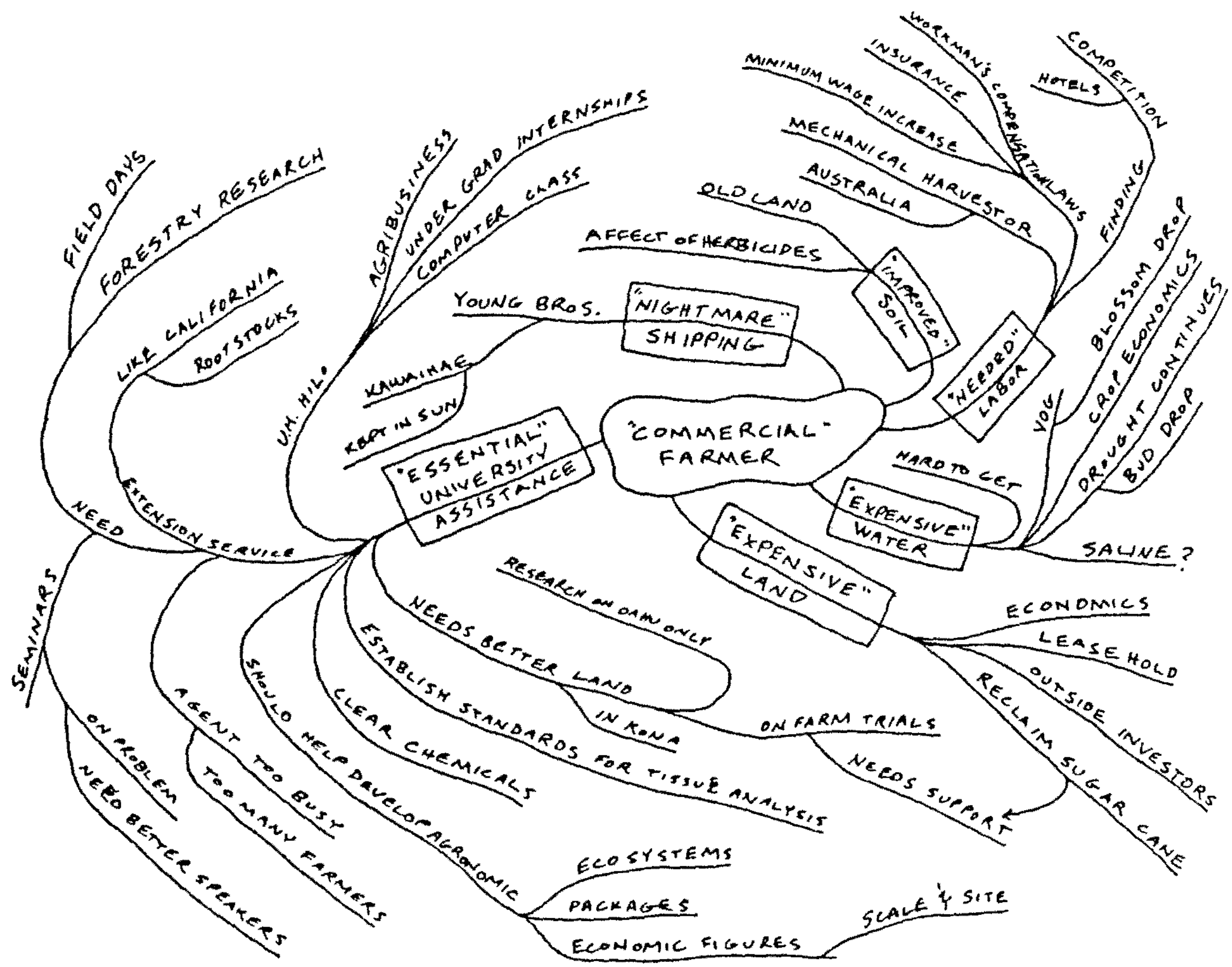


Figure 16. General Concerns of TT Group Farmers

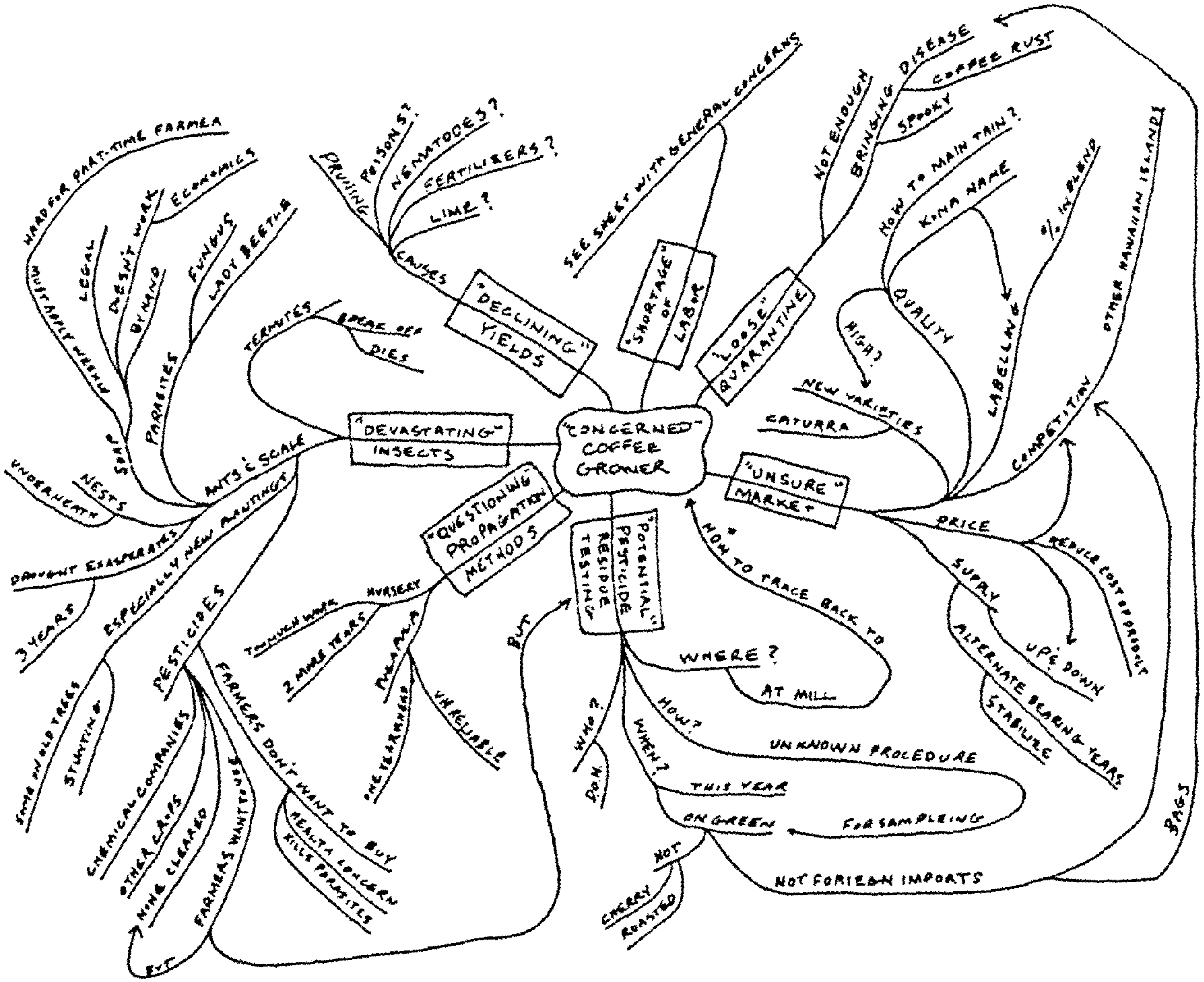


Figure 17. Coffee Concerns of KFC Farmers

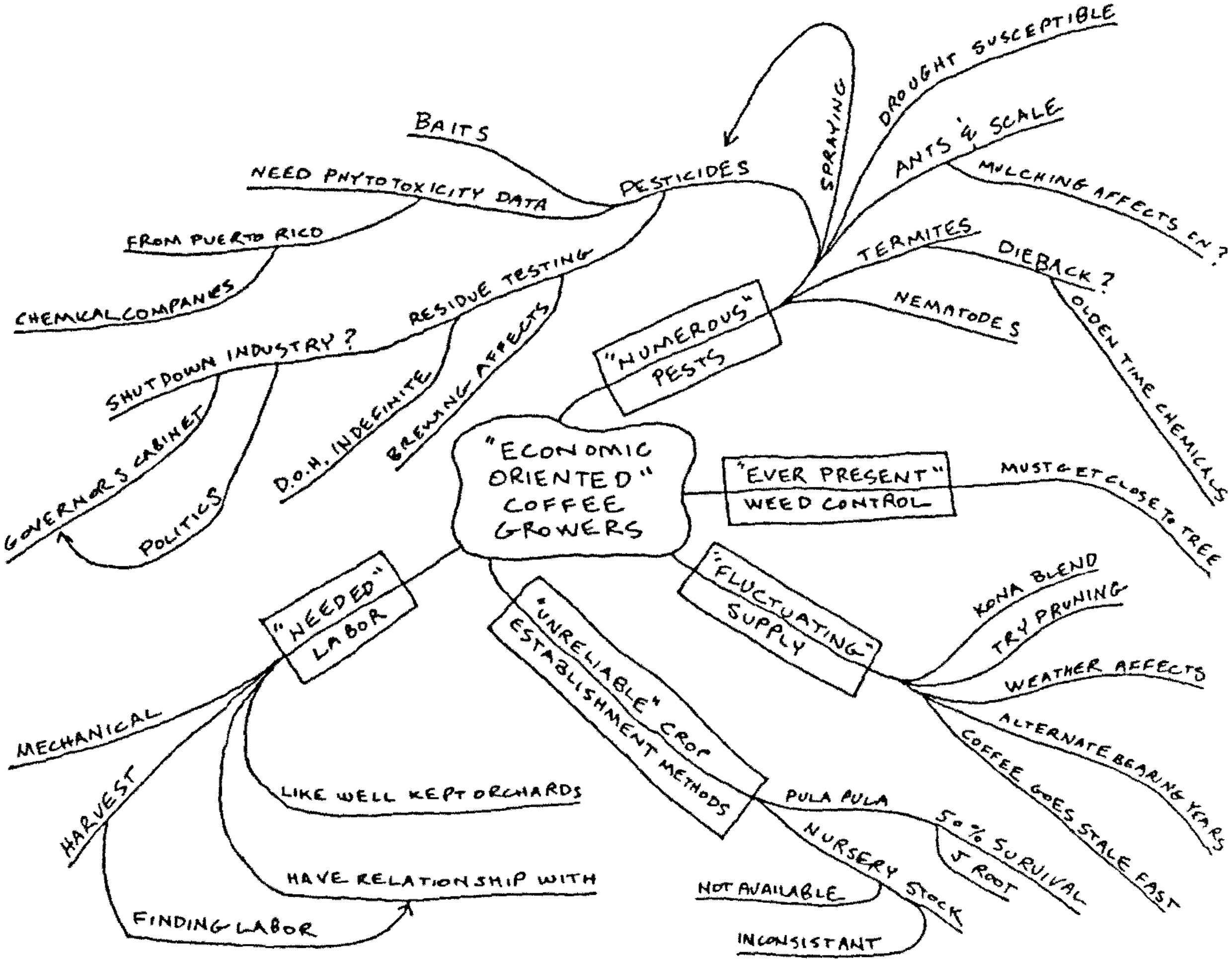


Figure 18. Coffee Concerns of TT Group Farmers

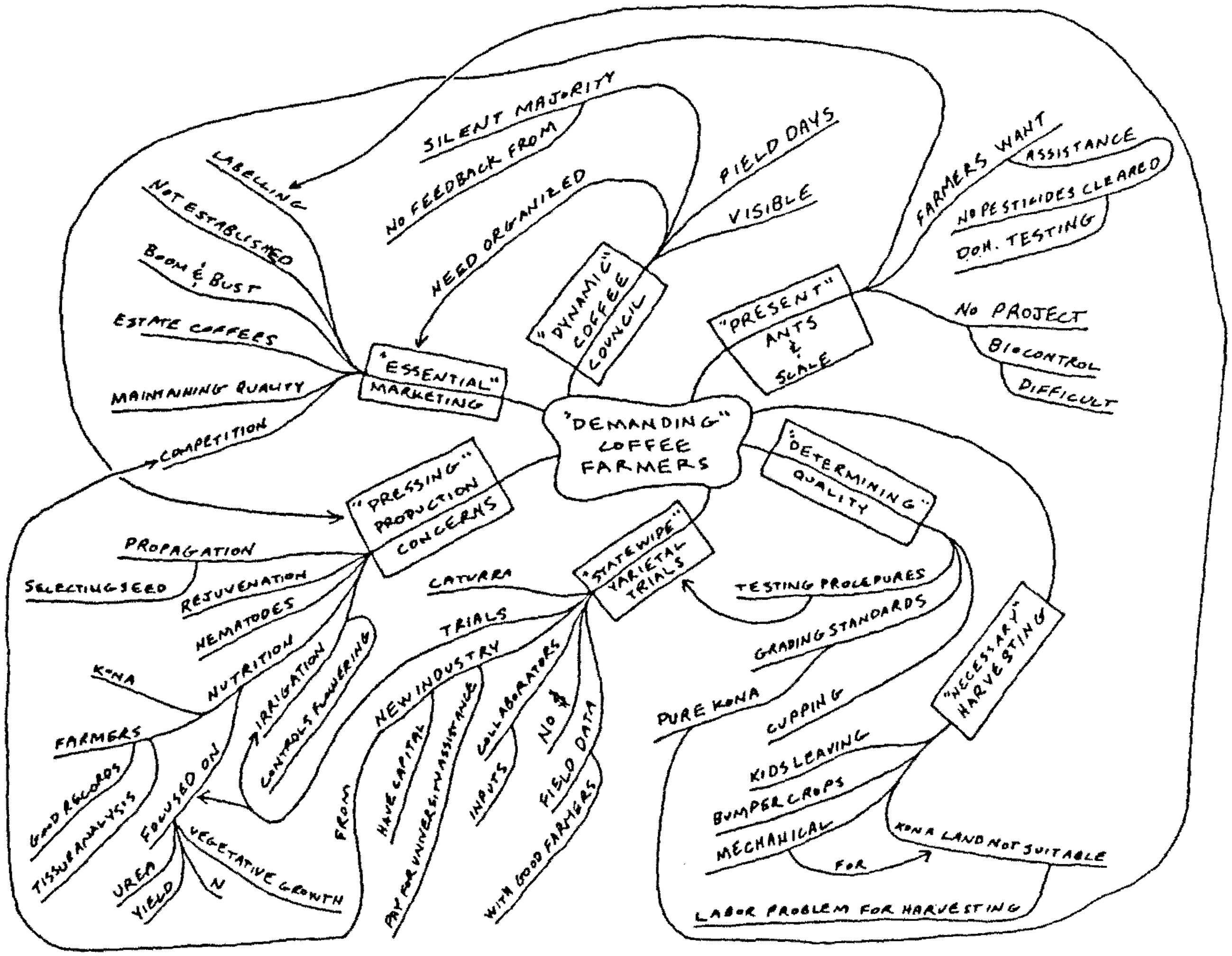


Figure 19. Coffee Concerns of Extension Service and Other Information Sources

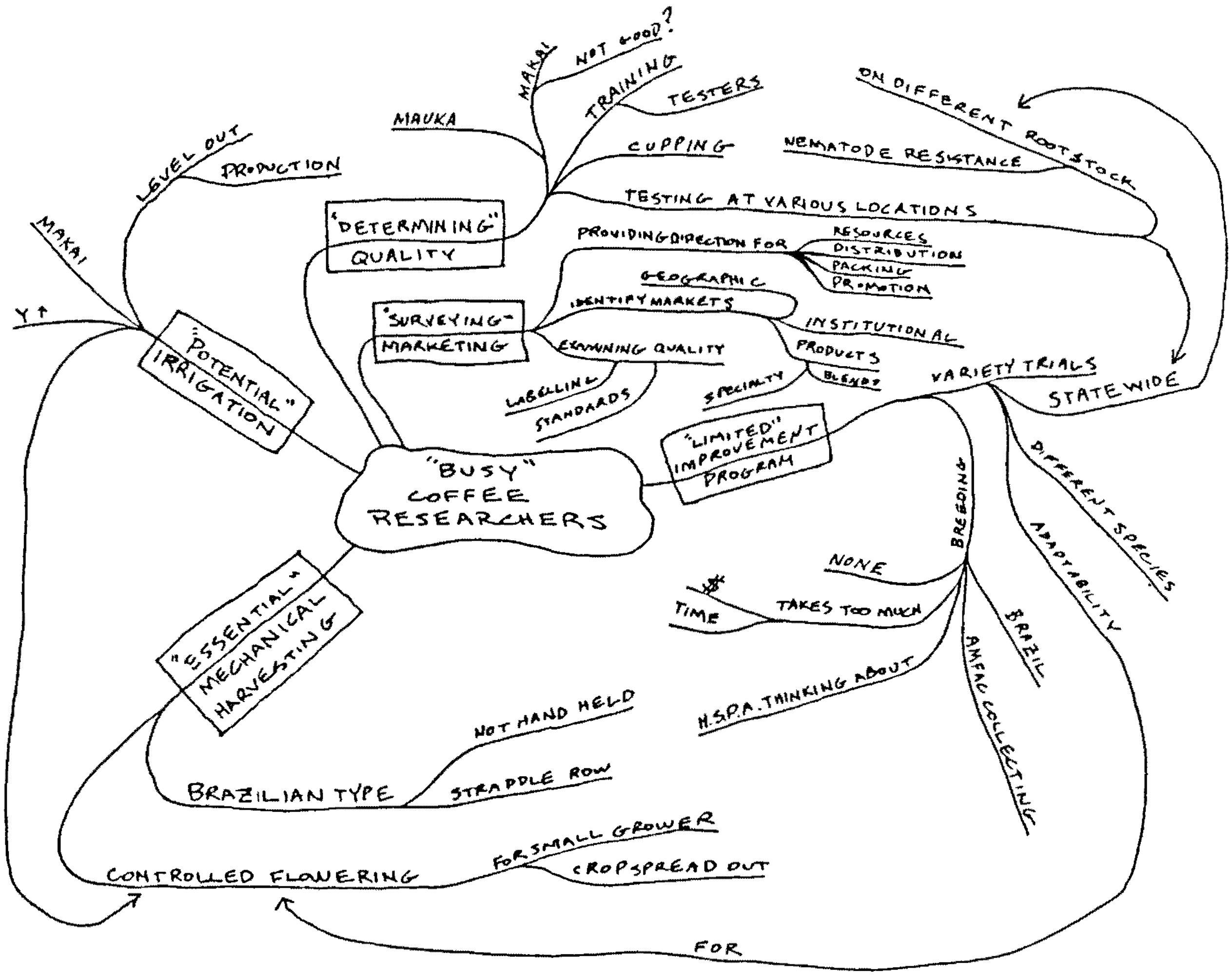


Figure 20. Coffee Concerns of Researchers

The analyst produced mind maps for the fourteen farmers interviewed that had key roles in the agrotechnology transfer process (TT group farmers). She identified these farmers because of their leadership roles in commodity and community organizations. Four of the group specialized in growing one of the three crops, two raised two of the crops and eight raised or discussed all three crops during their interviews. Five participants interviewed were members of farm management companies. Six were vertically integrated into processing and marketing activities for their respective crops. Two farmed land outside the Kona district, however, they held offices in farm organizations serving Kona. The analyst was informed by nine of the group that they had earned university bachelor degrees. The analyst found that these farmers tended to have a commercial outlook to farming and were extremely interested in obtaining new information and technology to increase their profits. Because they actively sought means to alleviate their concerns, they had a more positive attitude about controlling agricultural production factors than KFC farmers.

The analyst identified and produced composite mind maps for five people in the technology transfer group that had distinct, job-related roles in which they provided information to Kona's farmers and shared information between the community and UHMCTAHR. These people consisted of UHMCTAHR and farm organization staff working with researchers, farmers and farm organizations. The researcher group originally consisted of four UHMCTAHR staff members engaged in experiment or on-farm research activities in Kona. Two additional members were interviewed as a team when the analyst began Stage Three activities because their activities were mentioned by several participants during Stage Two as crucial for industry survival.

The analyst classified the themes of concern as either issue-based or primary-task oriented (pp. 35-36). She found that most KFC and TT farmer general (non-crop specific) concerns were issue-based because farmers stated that they were beyond their capacity for individually coping with them. These concerns were often crucial to the survival of their community or farming lifestyle. Specific crop concerns were often classified as primary-task oriented and, usually highlighted a need for improved farmer and UHMCTAHR performance, and were related directly to what the enterprises' missions were perceived to be. UHMCTAHR staff responses were usually technological in focus whereas many of the concerns, especially those that were issue-based, called for adjustments in human activity systems rather than the development of a specific technology.

a. Identified General Themes of Concern (not crop specific)

The analyst developed separate composite mind maps (Figures 15 and 16) for the two groups of farmers interviewed (KFC farmers and farmers in the TT group) outlining general, non-crop specific concerns. She did not develop separate composite mind maps for the extension service and other information sources and researchers because these groups tended to discuss commodity specific concerns. Table 4 presents non-crop specific themes of concern mentioned by KFC and TT group farmers during Stage Two interviews as illustrated by each leg of the composite mind maps.

Table 4. Non-crop Specific KFC and TT Group Farmer Themes of Concern Illustrated as Legs of Composite Mind Maps

Theme of Concern	Appearing as KFC Farmer Mind Map Leg	Appearing as TT Group Farmer Mind Map Leg
Pesticides	X	
Crop Harvest/Labor	X	X
Agricultural Water	X	X
Farming Assistance	X	X
Effects of the Volcano	X	
Agricultural Land	X	
Soil		X
Shipping of Agricultural Commodities		X

(1) Pesticides - The analyst observed that pesticide availability and use were frequently discussed with great emotion in Kona. Eleven farmers were concerned because pesticides were once freely available and they could not understand why the government had imposed restrictions on their current use. On the other hand, four KFC farmers expressed the concern of many other community members that pesticides might cause potential or residual harm to the soil, people, and environment. Six TT group farmers mentioned a need to develop chemical and biological pest control mechanisms.

(2) Crop Harvest/Labor - Early in the growing season, participants mentioned that the two main crops in Kona, coffee and macadamia nuts, ripened simultaneously and required hand labor to pick them. Nineteen KFC farmers raising both coffee and macadamia nuts mentioned this concern within the context of discussing coffee harvesting. Labor was scarce and expensive; amounting to approximately 70% of the cost of producing coffee. Four TT group farmers stated that

workman's compensation and insurance laws were bothersome and costly but that they had no choice, due to a limited number of family members living on the islands, but to hire harvest labor. During coffee harvest, macadamia nut picking and other activities often took second priority. Harvest season was a time when farmers were not readily available to meet with the analyst and some visits had to be scheduled three to four weeks in advance.

Older farmers expressed a desire to spread out the harvest season longer to find a way for year-round picking. This was specifically mentioned by two younger farmers who were holding down full-time jobs as well as harvesting coffee and macadamia nuts. Older farmers stated that they did not consider mechanical coffee harvesting practical because Kona's steep and rocky terrain was not suited for large-scale machinery. Land would have to be bulldozed and replanted; a capital expense amounting to over $2000 per acre. They expressed concern that green coffee beans would be collected which would ultimately reduce the quality of the coffee. Two new KFC farmer participants expressed interest in synchronized coffee flowering which would be advantageous for mechanical harvesting, enabling a once over the field pass with a large-scale machine.

(3) Agricultural Water - During 1987, the Kona region experienced drought conditions and farmers mentioned interest in developing irrigation resources. Eighteen KFC farmers mentioned the drought and/or irrigation concerns during their interviews. Most older KFC farmers were concerned about the drought conditions, however, they stated that irrigation was not a viable option because of its cost.

Four newer KFC farmers were in the process of installing or had irrigation systems installed. They were most concerned about the cost of water, yet they stated that it was a necessary input. KFC farmers told the analyst that they would consider using irrigation if it were available at reasonable cost. Most farmers felt the likelihood of this occurrence was not great.

UHMCTAHR research indicated that irrigation systems could assist in fertilizer delivery, water conservation, and in synchronizing coffee flowering. Normally coffee flowers about ten days after dry weather which is followed by a period of rain. Limited and irregular rainfall during early 1987 resulted in sporadic coffee flowering.

Three KFC farmers requested more practical information about irrigation. Which systems were best for specific locations? How did one set up the systems? How much water should be applied?

(4) Farming Assistance - Ten KFC farmers specifically commented about UHMCTAHR's limited response to Kona's farming concerns. Most of them knew who the extension agent was because of his weekly column in the local newspaper, however, they requested that more on-farm visits be made available. Older farmers recounted to the analyst about the time when the agricultural experiment station manager and researchers undertook on-farm collaborative experiments with farmers.

New KFC farmers requested information pertaining to managerial and technical aspects of farming. Updated publications and adult education classes were requested from UHMCTAHR. Increased communication and on-farm visits/trials between KFC staff, UHMCTAHR, farm organizations and farmers were requested during the analyst's interviews.

(5) Effects of the Volcano - Three KFC farmers specifically stated that they believed that the volcanic eruption of Kilauea volcano in East Hawaii affected Kona's weather. Numerous farmers and newspaper letters to the editor blamed volcanic activity for the exceptionally dry weather pattern that occurred for the past three years. Many cited the weather as causing erratic and inconsistent crop flowering. Farmers told the analyst that coffee propagation by pulapula method (pulling and transplanting volunteer seedlings) was affected severely by the persistent drought conditions.

(6) Agricultural Land - This was an area of heated discussion within the community. There were over 400 agricultural lessees in Kona. Four KFC farmers told the analyst that they had been leasing land which their fathers or grandfathers secured from large land owners at the turn of the century. Three expressed concern that, because of land owner desire to sell land for housing and commercial ventures, leases were not being renewed. Because of the uncertainty of the leases, loans for capital improvements were difficult to secure. This concern was so strong that the KFB submitted a proposal to the GACC for a soft systems analysis to address the emotionally charged issue.

(7) Soil Condition - During this interview several KFC farmers told the analyst that their soils were rocky. Three TT group farmers stated that they felt a need to improve their soil because it had been continuously farmed for years. Two others expressed concern

about the affect of continual herbicide use, a common practice with coffee production in Kona.

(8) Shipping - During 1987-88, there was only one interisland shipping company servicing West Hawaii and three avocado shippers complained that fruit was damaged when it was kept out in the sun at the port, Kawaihae.

b. Classification of General Themes of Concerns

Table 5 presents the nature of KFC and TT farmer general concerns as classified by the analyst. Most of the concerns were issue-based because they addressed management of natural and social environments, rather than tasks of organizations or groups of people.

The analyst classified pesticide concerns as issue-based because some KFC farmers stated that they were very concerned with community health and physical well-being (environmental pollution and personal safety). To other KFC members, survival of the industry as a whole was in question because farmers needed something to control ants and scale which were reducing coffee production. A mill closure could result if the Department of Health found pesticides in coffee processed by KFC. The analyst felt that, because some of the community wanted freer pesticide use while others wanted them completely banned, this issue required extensive community discussion and planning.

The analyst classified crop harvest/labor concerns as issue-based because they involved long-range planning. No immediately available solution was mentioned by participants. Because the tourist industry continued to grow in West Hawaii and siphoned off Kona's labor force, the number of coffee and macadamia nut pickers was limited.

Table 5. Classification of KFC and TT Farmer General Themes of Concern

Concern Presented on Composite Mind Maps	Classification of Concerns by KFC Farmers	TT Group Farmers
Pesticides	I1	
Crop Harvest/Labor	I1	I1
Agricultural Water	I1	I1
Farming Assistance	P1, I2	P1
Effects of the Volcano	I3	
Agricultural Land	I2	I1
Soil		P2
Shipping		I3

I1 - Issue-based, Long-range planning
I2 - Issue-based, Due process
I3 - Issue-based, Generic
P1 - Mission of UHMCTAHR and KFC
P2 - Mission of UHMCTAHR and farmers

Agricultural water and related irrigation concerns were classified by the analyst as long-range planning concerns. Farmers stated that this concern had no immediate solution because urbanization was occurring rapidly and competing for limited water resources. They stated that the development of a water delivery system and the cost of the water would prohibit them from ever using irrigation water. The analyst learned that the Soil Conservation Service was investigating the possibility of helping groups of farmers to develop small reservoirs. This involved developing human activity systems to organize farmers; the analyst saw no evidence of this program being enacted during the time of the study.

The analyst classified farming assistance concerns as both primary-task and issue-based. KFC farmers told her that UHMCTAHR's and

KFC's reason for existence was to assist farmers. They stated that they were not receiving enough information and technology pertinent to their needs. They stated that they were left out of a process designed to comprehend their needs because the means to collect information about farmers' needs (attending meetings) was inappropriate. Many KFC farmers told the analyst that a UHMCTAHR researcher stationed in Kona during the 1940's had worked directly with farmers to develop information appropriate for Kona's cropping systems. The analyst determined that a human activity system that comprehended Kona's needs and developed pertinent information and technology was needed.

The continuing eruption of Kilauea volcano was classified by the analyst as a generic concern caused by nature because it was outside anyone's control. Any action which could be taken would have to focus on managing affects of the volcano.

The analyst classified concerns related to land availability (shortened leases, in particular) as due process issues. KFC farmers stated that planners did not appreciate the historical perspective of the leasehold situation; that their families had leased the same farms for three generations. The course of action taken by the KFB to undertake a soft systems analysis illustrated desire to bring farmers into the process for improving the lease situation.

The analyst classified soil concerns as primary-task concerns because TT group farmers stated that it was their responsibility to maintain and build its fertility and that UHMCTAHR could assist them with appropriate information and technologies.

The analyst classified shipping concerns as issue-based because they pertained to the transportation system serving West Hawaii. She was informed that the community counted on one company to take care of their commodities on the docks as well as provide timely delivery to Oahu. TT group farmers called for improvements in the management practices of this entity.

c. Identified Coffee Themes of Concern

Table 6 presents themes of concern illustrated on the legs of the composite mind maps (Figures 17, 18, 19, and 20) for each of the four perspectives identified by the analyst.

Table 6. Coffee Themes of Concern for KFC Farmers, TT Group Farmers, Extension Service and Other Information Sources and Researchers Illustrated as Legs of Composite Mind Maps

Theme of Concern	Appearing as KFC Farmer Mind Map Leg	Appearing as TT Group Farmer Mind Map Leg	Appearing as ESIOS[a] Mind Map Leg	Appearing as Researcher Mind Map Leg
Insects/Pests	X	X	X	
Pesticide Testing	X			
Yield Decline	X			
Quarantine Laws	X			
Marketing/Supply	X	X	X	X
Propagation	X	X		
Labor/Harvesting	X	X	X	X
Weeds		X		
Variety Trials			X	X
Quality			X	X
Other Production Concerns			X	
Coffee Council			X	
Irrigation				X

[a] ESOIS - Extension Service and Other Information Sources

(1) Insects - The concern mentioned most frequently by KFC farmers interviewed (73%) pertained to coffee insects, particularly, ants (including *Pheidole megacephala* and *Anoplolepis longipes*) and green scale (*Coccus viridis*). Twenty-nine percent of TT group farmers mentioned ants and scale as their major concern. Ants and scale enhanced the growth of another parasite, black sooty mold, which produced a black layer covering the leaf lamella. Liquid detergent or insecticidal soap, at a concentration of 1-3 tablespoons per gallon of water, sprayed directly on the plant was the only control legally available during Stage Two's interviews. Because the residual affect of soap was minimal, weekly hand applications were often necessary. Many KFC farmers claimed that soap was ineffective. Part-time KFC farmers stated that it was not an economically viable control because they had limited time for pest control activities.

A major area of concern for 55% of KFC farmers was that chemicals were not registered to control coffee insects. Farmers stated that chemicals were available for ant and scale infestations on other crops they were raising but not for coffee. One TT group farmer mentioned that phytotoxicity data from a chemical company with experiments in Puerto Rico should be obtained to expedite clearance of pesticides. Members of KCC's board of directors mentioned that chemical companies did not have economic incentive to clear chemicals for coffee, a crop with only approximately 3000 acres nationally, due to Environmental Protection Agency requirements.

During Stage Two's interviews, KCC's board of directors discussed the management of the ant and scale problem at every meeting. Members stated that, although ant and scale were major production concerns of Kona's farmers, research was not adequately supported. The 1986 IAP had rated the problem as priority number 19 of 21 bottlenecks. KCC's board of directors moved to obtain funding from GACC so that UHMCTAHR could undertake the necessary pesticide testing for clearance.

Researchers told the analyst that 1) there was no serious ant and scale problems because insect levels were affected by climatic changes and that drought conditions were temporary, 2) ant and scale were not rated high enough in the IAP to be funded, and 3) coffee was not a large crop in Hawaii.

Termites that attacked and caused coffee plants to break off and die were also mentioned by KFC farmers. TT group farmers questioned if termites caused trees to die and if toxic chemicals used to control them in the past could affect tree vigor. TT group farmers mentioned nematodes as potential coffee pests.

(2) <u>Pesticide Residue Testing</u> - Participants informed the analyst that the problem that chemicals were not cleared for coffee insect infestations was combined with the possibility that the State Department of Health would be undertaking pesticide residue testing for the first time during 1987-1988 harvest season. They stated that they lacked information pertaining to the testing procedures, including whether or not testing would only be done on green coffee, rather than cherry (the harvested, unpulped berries) or on roasted beans. The analyst learned that this was especially important because individual farm lots of coffee cherry were combined at the mills for processing to green coffee. An entire batch of green coffee might be contaminated if

one farmer had used unregistered chemicals. Coffee mills had no way to trace which farmer had delivered contaminated coffee cherry.

(3) Marketing - Even during the early portion of the 1987 production cycle, participants mentioned marketing issues to the analyst. She learned that the coffee supply varied alternately by year because coffee trees naturally bear heavily every other year. KCC's processor members predicted that the 1987-88 harvest would be light. Participants mentioned a need for stabilizing supply in order to even out price fluctuations and that storage of green coffee was impractical because it rapidly became stale.

Kona participants stated that large agricultural corporations on other Hawaiian islands would be future competitors. Plans to raise coffee on Molokai and Kauai suddenly became real when two companies on these islands started seedling nurseries.

The analyst learned that a UHMCTAHR marketing research study was assisting Kona's coffee industry in using more effectively its resources, distribution systems, packing standards, and promotional efforts. It would identify 1) geographic and institutional markets, 2) various products and 3) labelling issues. Researchers undertaking this project stated that the focus was to "shed light" on the industry's options, but that the industry would make its own decisions about its future.

(4) Quality - Maintaining the world renowned Kona coffee quality was mentioned to the analyst as a major concern. Participants told her that the name "Kona coffee" was a big marketing chip for their product. Newer varieties such as Caturra were being raised by some

farmers, yet the analyst observed that beans were mixed with the traditional Kona Guatemalan variety at harvest. The extension service and other information sources group stated that there was a need for testing quality and establishing standards for what could be sold as "Kona coffee".

Participants stated that Kona coffee should not be blended with "inferior" quality coffees. Members of the extension service and other information sources group stated that protecting the name of "Kona" coffee through strict labelling, especially for pure Kona coffee, was important. KCC's board appointed a special committee for investigating fully this concern.

Currently individual coffee tasters have private criteria (aroma, body, color, etc.) and procedures (brewing times, swishing it in the mouth, etc.) for evaluating coffee taste, however, no standard, industry-wide guidelines exist. The analyst was informed that a UHMCTAHR program was developing guidelines for training coffee tasters and a list of taste criteria. Two researchers mentioned that efforts were underway to obtain sustained funding in support of this evaluation program, however, they were not convinced these funds could be marshalled.

(5) Harvesting - The shortage of people available as a labor pool to pick coffee was identified as a major concern as discussed under general concerns (pp. 96-97). Seven TT group farmers specifically mentioned the shortage of coffee pickers as a major concern. They stated that finding labor for coffee picking relied on personal relationships between farmers and pickers. One extension

service and other information source was responsible for organizing workers' schedules with growers' needs.

UHMCTAHR had supported one farmer in developing a hand-held harvester (a modified jigsaw that could shake each branch at variable speeds) by interviewing him on video tape. The main focus of the UHMCTAHR's program involved large Brazilian type harvesters that straddled rows and indiscriminately harvested all cherry whether ripe or still green. One researcher stated that there was a need to develop a program for coordinated cultivar, physiology (flowering) and irrigation research to help alleviate the shortage of pickers.

(6) Quarantine Enforcement - One KFC farmer mentioned that quarantine laws were too lax, especially since large companies on neighbor islands were importing new coffee varieties from areas with coffee rust. He expressed concern that bags in which coffee was imported could bring in unwanted diseases.

(7) Declining Yields - One KFC farmer and a member of KFC's staff stated that yields per acre during the 1980's were lower than during the 1950's. Participants cited the following factors as possible causes for production declines: 1) pruning trees lower for easier harvest, 2) "poisons" (herbicide use), 3) nematodes, 4) three years of drought, and 5) insufficient fertilizer and lime use.

(8) Propagation Methods - The analyst learned that coffee was traditionally planted by a means referred to as "pulapula". "Volunteer" seedlings were pulled-up from underneath mother plants and then replanted in desired locations. Transplanted seedlings produced a crop two years after planting. If seeds were sprouted in a nursery and

seedling trees then transplanted to the field crop, production was delayed one year. The analyst found that commercial nursery seedlings were not available on a regular basis. She was informed by farmers that seedlings from nurseries were of inconsistent quality because they often were pulapulas planted in nursery bags.

(9) Weed Control - TT group farmers reported that they were concerned with the necessity of getting complete weed control close to their trees because coffee trees had shallow feeder roots. The analyst learned from the extension agent that root zone competition retarded the growth of coffee trees.

(10) Coffee Council - All members of the group consisting of extension service and other information sources staff mentioned that KCC was a visible structural entity working to help farmers with production and marketing problems. One member of the group stated that although KCC represented the "silent majority of farmers who did not participate in commodity meetings," it did not receive feed back from these farmers.

(11) Statewide Varietal Trials - The analyst learned from KCC and UHMCTAHR staff that on-farm trials involving different coffee species and root stocks were being planted. Entries were to be evaluated for controlled flowering to facilitate mechanical harvesting. One UHMCTAHR staff member told the analyst that UHMCTAHR had spent no IAP funds for this project which ranked as the lowest IAP priority. The analyst observed that 75% of the project collaborators were companies located on other Hawaiian islands.

(12) Irrigation - Two researchers mentioned irrigation as a means to even-out production among years (to break the coffee's pattern of alternate-year bearing), to increase yield, and to open up land at lower elevation for production.

d. Classification of Coffee Themes of Concern

Table 7 presents types of coffee concerns for the four viewpoints as classified by the analyst. She classified concerns relating to coffee insects (particularly ants and scale) as both primary-task and issue-based for KFC farmers. Farmers produced coffee cherry as their main activity and controlling pests was a major subactivity undertaken during the vegetative season. Many KFC and TT group farmers and some extension service and other information sources stated that it was the responsibility of UHMCTAHR to assist their efforts by clearing effective pesticides or developing alternative (e.g. biological) control methods. The analyst classified the concern as issue-based because there would not be a Kona coffee industry without an adequate level of coffee cherry. She classified coffee pest concerns as issue-based concerns for TT group farmers because they stated that they felt left out of the process of planning new methods for handling the situation.

The analyst classified potential pesticide residue testing as issue-based because of the possibility of mill closure threatened survival of the industry if pesticides were detected in Kona coffee cherry.

KFC farmer concerns related to declining yields were classified by the analyst as both issue-based and primary-task oriented because lower

Table 7. Classification of Coffee Themes of Concern

Concern Presented on Composite Mind Maps	Classification of Concerns by KFC Farmers	TT Group	ESOIS[a]	Researchers
Insects/ Pests	P1	P1 I2	I1	
Pesticide Testing	I1			
Yield Decline	I1 P2			
Quarantine Laws	I1			
Marketing/ Supply	I1	I3 P3	I1 P4	P4
Propagation	P1	P1		
Labor/ Harvesting	I3	I3	I1 P5	I4
Weeds		P1		
Variety Trials			I1 P1	P1
Quality			P3	P6
Other Production Concerns			P1	
Coffee Council			I1	
Irrigation				P1

I1 - Issue-based, Industry survival
I2 - Issue-based, Due process
I3 - Issue-based, Long-range planning
I4 - Issue-based, generic
P1 - Primary-task, Mission of farmers and UHMCTAHR
P2 - Primary-task, Mission of farmers
P3 - Primary-task, Mission of UHMCTAHR
P4 - Primary-task, Mission of KCC and coffee processors
P5 - Mission of farmers and retail equipment dealers
P6 - Mission of UHMCTAHR and DOA

[a]ESOIS - Extension Service and Other Information Sources

yields meant potential loss of income to individual farmers and possible closure of the mill due to insufficient coffee cherries. Farmers stated that it was their mission to grow the most cherry that they could.

One farmer told the analyst that loose quarantine standards threatened industry survival because if any plant pathogens were introduced (e.g. coffee rust) to Kona, the affects would be devastating. Two farmers mentioned that systems to monitor the introduction of pathogens were necessary. The analyst classified the concern as issue-based because the industry's survival would be threatened if pathogens were introduced.

The analyst classified marketing concerns as issue-based concerns because farmers and members of the TT group realized that a market had to be maintained in order to sell Kona's coffee. Farmers mentioned that KCC should undertake activities that would ensure a market for Kona coffee.

The TT farmer concern regarding fluctuating coffee supplies was classified by the analyst as an issue-based concern and a primary-task concern. Those interviewed said that avenues of potential action were 1) storing green coffee and controlling the supply of the product or 2) controlling the growth habit of coffee trees so that they would bear evenly annually. The analyst observed that UHMCTAHR researchers were able to secure information from private processors where members of the Kona community and KCC could not.

The analyst classified propagation concerns as primary tasks of farmers and UHMCTAHR because they addressed aspects of coffee production.

The analyst classified labor/harvesting concerns as issue-based because the industry needed an economically viable means to harvest the crop or it would not be able to compete with other gourmet coffees on the market. Extension service and other information sources stated that farmers were best equipped to develop small hand-held machines.

The analyst classified UHMCTAHR research related to mechanical harvesting concerns as issue-based because it was something that they were undertaking based on their sense of importance. Their activities included development of irrigation, flowering and pruning techniques to assist in adapting mechanical harvesting machines to Hawaii's ecological conditions. Farmers also had the responsibility of adapting harvesting devices to their field conditions.

The analyst classified TT farmer weed control concerns as primary-task oriented because they related to activities fundamental to their sense of mission and were undertaken by 1) farmers who cultivated the crop and 2) UHMCTAHR that could supply information and technologies on how best to do this critical function.

The analyst classified the state-wide variety trials as both issue-based and as primary-task oriented. Participants stated that UHMCTAHR had a mission to support the coffee industry. Collaborating farmers supplied inputs and their participation was seen as necessary in order to produce the crop the that would provide the best business opportunity.

The analyst classified concerns related to determining coffee quality as a primary-task of UHMCTAHR because it was the only local entity available with the capacity to undertake this task.

Other production concerns were classified by the analyst as primary tasks of both farmers and UHMCTAHR because they were related to essential activities which farmers had to undertake to produce coffee. UHMCTAHR's role was to assist farmers to do this task better.

The analyst classified concerns related to the coffee council as issue-based because extension service and other information sources stated that they were essential for industry survival. KCC undertook several essential industry activities: lobbying, promoting, obtaining funding, communicating grower and processor needs, being an industry focal point, and transferring information and technology.

The analyst classified irrigation concerns as primary-task oriented. UHMCTAHR researchers had the task to develop irrigation models and evaluate the effects of various irrigation applications. Farmers had the task of securing the water, installing the equipment and applying water when needed.

6. Determining the Relative Importance of Themes of Concern and Comparing Them with IAP Bottlenecks

The analyst counted each time a concern was mentioned on the individual mind maps she collected during Stage Two in order to determine its relative importance. The number of times each coffee, macadamia nut and avocado concern was mentioned by the KFC farmers and TT group participants and its rank among other mentioned concerns are presented in Table 8 and Tables 49 and 50 of Appendix C.

Table 8. Frequency and Rank of Coffee Concerns Mentioned by KFC Farmers and TT Group Participants

Concerns	Frequency of KFC Farmer Responses	KFC Farmer Rank	Frequency of TT Group Responses	TT Group Rank
Insects/Pests	32	1	8	2
Pesticides	24	2	7	3
Labor/Harvesting	12	3	11	1
Drought/Irrigation	12	3	3	6
Marketing	8	5	5	4
Quality	4	6	5	4
Pruning	3	7	0	10
Weeds	3	7	2	7
Seasonality	2	9	0	10
Quarantine Laws	2	10	0	10
Propagation	1	11	1	8
Yield Decline	1	11	1	8

The analyst then compared concerns she had identified with IAP bottlenecks because she found that some of the concerns voiced as most urgent by KFC farmers were not reflected in the respective coffee, macadamia nut and avocado IAP's. She noted that some concerns were broad and encompassed problems beyond the scope of a single commodity. IAP's focussed on bottlenecks that were often reduced at the onset of the undertaking due to the *a priori* categories used to focus attention on what problem areas to look into. They often reflected discipline lines existing in the UHMCTAHR system, even though members of the industry told the analyst that they were interrelated. Tables 9 and Tables 51 and 52 in Appendix C reflect the analyst's attempt to examine concerns recorded by the analyst during Stage Two's interviews and corresponding bottlenecks identified via the IAP process.

Table 9. Comparison of KFC Farmer Coffee Concerns and IAP Bottlenecks

Bottlenecks Identified by the May 1986 Coffee Industry Analysis	IAP Priority	This Study's Concerns	KFC Farmer Rank
Kona Coffee Council Staff*	1	Farming Assistance	
Protect Kona Coffee Name*	2	Marketing	5
Market Potential and Promotion	3	Marketing	5
Diseases on Imported Coffee	4	Quarantine Laws	10
Cost of Insurance and Workers Compensation	5	Labor	3
Labor for Harvesting	6	Labor	3
Symptoms of Nutrient Deficiency*	7		
Year-to-Year Yield Variation and Harvest Spread	8	Seasonality	9
Future Availability of Land in Kona	9	Land	
Water for Irrigation	10	Drought/Irrigation	3
Lack of Information on Kona Acreage*	11	Farming Assistance	
Lack of Information on Culture and Management*	12	Pruning	7
Cupping Quality Related to Several Factors	13	Quality	6
Weed Control	14	Weeds	7
Dependence on One Cultivar	15		
Coffee Replant Information*	16	Crop Establishment	11
Profitability Analysis Needed*	17	Farming Assistance	
Mechanical Harvesting Systems*	18	Labor	3
Scale and Ants	19	Insects	1
Growing Conditions Outside Kona	21		
		Additional Concerns	
		Pesticides	2
		Decline	11
		Farming Assistance and Land included as non-crop specific concerns	

*indicated HOW to solve a problem rather than identifying WHAT was the concern

The analyst noted that some IAP bottlenecks were more specific than this study's broader themes of concern. For example, the "cost of insurance and worker compensation" and "labor for harvesting" IAP coffee bottlenecks fell into the larger soft system theme of concern of "labor" because they were interrelated. Insurance and worker compensation were major concerns mentioned by participants when they discussed harvest labor concerns.

The analyst found a most striking example of non-congruence between IAP and this study's coffee concerns with the coffee ant and scale and related pesticide concerns. These were ranked as number 19 bottleneck out of 21 possible on the IAP, but were the most pressing concerns identified by the soft systems analysis. Other marked discrepancies were found with 1) quarantine laws (for disease control) ranked fourth on the IAP and tenth by the KFC farmers) and 2) drought and related irrigation concerns (ranked tenth on the IAP and third by the KFC farmers).

The analyst noted that few KFC farmers contributed to the coffee, macadamia nut, and avocado IAP's.

D. <u>Summary of Stages One and Two</u>

During the period of 1 April through 31 August 1987, the analyst became acquainted with the Kona farming community; focussed her dissertation research activities; collected background information; interviewed sixty-eight participants; attended community meetings; and then organized, analyzed and summarized collected data. Results included 1) a synopsis of relevant background and regional information, 2) a complete description of the area (rich picture), and 3) an identification and classification of key themes of concern expressed by those involved in the activities related to Kona's agriculture. During Stage Three, participants examined possible improvement scenarios for concerns mentioned during Stage Two.

Stage Three - Envisaging Improved Situations

During Stage Three, participants described activities that they said were lacking and needed in order to improve concerns (relevant systems) that they had identified during Stage Two. They formed root definitions using the CATWOE technique described on pp. 45-46. The analyst updated the rich picture as it developed during Stage Three.

Scheduling revisits was difficult because they conflicted with harvest. Some revisits were postponed for two months. Seventy-five percent of the KFC farmers and ninety-six percent of the TT group interviewed during Stage Two participated in Stage Three.

A. Developing Improvement Statements

The analyst showed participants composite mind maps she had developed during Stage Two to initiate discussion on major themes of concern. Starting with the composite mind map illustrating KFC themes of general concern (Figure 15, p. 88), she discussed each leg of the diagrams from each of the four worldviews described on pp. 87 and 94-95. Then specific coffee, macadamia nut and avocado concerns were discussed. The analyst asked participants if there were other concerns not on the composite mind maps, however, no new ones were mentioned. Farmers commented that they did not know much about UHMCTAHR's and the commodity associations' programs.

After discussing each set of crop or non-crop specific composite mind maps, the analyst asked participants to choose one or two concerns that they felt were most in need of improvement. She then asked participants to think of an improvement, describe it, and explain what would happen in an improved situation in order to identify key transformations desired. She then asked participants what activities had to occur in the improved state.

The analyst asked participants to complete the CATWOE mnemonic in order to identify critical components of statements about improved systems. She recorded CATWOE transformations (T's) first; then subsequently developed other CATWOE categories. Starting with the customers (C's), she asked participants who they saw benefiting from their envisaged improvements and who might be hurt or stand to loose if the improvements actually happened. Participants identified actors (A) when asked who they saw doing the improved actions that they had previously described.

KFC participants often failed at being able to envision the owners (O) (those who could possibly help or hinder the improved situation) and environmental constraints (E) that could affect the future improved situation(s). The analyst often left this information blank.

After identifying key transformations, the analyst asked participants to state why they valued improvements that they had mentioned as important. She recorded their statements under the CATWOE W category. At the end of the interview, the analyst asked participants why they thought that their improvements were correct views of how the situation should be.

B. Completing Root Definitions for Modeling

The analyst tabulated all the transformation statements gathered during Stage Three's interviews according to their corresponding concerns (Table 10). Forty-one percent of the participants discussed concerns related to coffee. Coffee marketing concerns were discussed by 30% of the participants. The analyst was informed by participants that at the time of Stage Two, the crop was still growing and production concerns were most important, but at the time of Stage Three, harvesting and marketing was underway. Fifty-four percent of the participants discussed coffee quality in conjunction with its reputation and place in the market.

Farmers and those dealing directly with farmers in the TT group stated that improvement was needed in the area of farming assistance. Thirty percent of the participants mentioned this concern, making it tied with marketing concerns as the most discussed concerns.

The analyst then examined those relevant system statements and root definitions which had been mentioned most frequently by participants. She completed relevant systems and root definition statements by combining information she had gathered from participant interviews in response to coffee marketing and quality, farming assistance and coffee insects. Her subsequent work was based on these concerns. Working with CATWOE information from participants for these concerns, the analyst prepared composite sheets for each of the CATWOE components. Long lists of attributes addressing improvements for the concerns resulted. The analyst then examined each component list separately, beginning with transformations that were mentioned and determined <u>what</u> people wanted to see occur. She found that some T's mentioned were not really "whats" but "hows" which she additionally separated. Later participants examined these "hows" as potential changes for improvement

Table 10. Percent of Participants Discussing Concerns as Relevant and Needing Improvement

Concerns	Percent of KFC Farmers Discussing Concern	Percent of TT Group Discussing Concern	Percent of Total Discussing Concern
General Concerns			
Farming Assistance	36	22	30
Land	3	4	4
Loans	3	0	2
Coffee Concerns			
Insects	39	13	29
Marketing	30	30	30
Harvesting (Labor)	24	22	23
Quality	15	35	24
Irrigation	3	4	4
Industry Development	0	4	2
Macadamia Nut Concerns			
Rats	27	0	16
Marketing	18	17	18
Quality	9	17	13
Dieback	0	22	9
Insects	6	4	5
Crop Loss Assessment	0	13	5
Increasing Production	0	9	4
Soil	3	0	2
Germplasm Collection	3	0	2
Harvesting	0	4	2
Industry Development	0	4	2
Avocado Concerns			
Summer Varieties	18	22	20
Marketing	6	26	14
Fruit fly/Mainland Clearance	6	4	5
Fruit Drop	3	4	4
Quality	0	9	4

Concerns	Total Discussed	Percent of Total Concerns
General	20	13
Coffee	62	41
Macadamia Nut	43	28
Avocado	26	17
Total	151	

during Stage Six activities. She concentrated on verbs that had been mentioned by participants and chose a minimum number to convey the meaning of the desired function. She discussed these with a subgroup of participants during Stage Four activities to arrive at an exact, desired wording. Other CATWOE components were tabulated in the same manner. Table 11 presents the relevant system and root definition statement that resulted for the farming assistance concern. A similar relevant system and root definition statement for coffee marketing and quality concerns can be found as Table 53 (Appendix D).

C. Rich Picture Revisited (October 1987)

While Stage Three activities were occurring, the situation pertaining to three themes of concern changed and the analyst updated the rich picture that she had developed during August 1987 (pp. 60–118).

1. Coffee Ant and Scale Concerns

During Stage Three, UHMCTAHR staff not stationed at Kona, on-site TT group participants and the analyst visited farms to observe the problem situation. During one visit, a UHMCTAHR staff member stated that "facts and figures" were needed for substantiating that the problem warranted action. Subsequently, the analyst advised the KFC field representative on how to make a random, confidential telephone survey of forty KFC farmers. They also examined rainfall data from the 1930's through the 1980's because many farmers stated that increased ant and scale levels resulted from the 1983–88 drought conditions. Annual rainfall was calculated as an average of three stations

Table 11. A Relevant System and Root Definition Statement For Farming Assistance Concerns

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Relevant System:
A system to provide information and technology pertinent to Kona's (West Hawaii's) agricultural needs.

Root Definition:
A public (University of Hawaii and Hawaii State Legislature)-owned and private (farmer)-owned information and technology provision system that operates under the following environmental constraints that it takes as givens:

1) Resources are limited (staff, land, funding, etc.).
2) Some farmers are reluctant to actively seek information and technology including participating in farmer organizations.
3) It might not be possible to meet farmer needs technologically.
4) Kona's environment is different from all other areas in Hawaii.
5) Organizations charged with doing this task can become bureaucratic and difficult to change.

This information and technology provision system is carried out by the following actors:

The University of Hawaii, farm organizations, farmers, private businesses and elected officials.

It directly affects the following customers:

Beneficiaries: Farmers, marketers, consumers, home owners, farm organizations, businesses, the University and other areas of the State with similar crops.
Victims: People not willing to change their operations.

The worldview that makes this transformation meaningful contains at least the following elements among others:

1) There should be more information and technology pertinent to Kona's farming problems available.
2) Research should focus on problems farmers perceive as important.
3) More work needs to be conducted on-site because of Kona's unique environment.
4) Diversified agriculture (e.g. those crops grown in Kona) is a viable alternative to sugar and pineapple, can complement tourism, and should be encouraged.
5) The community (e.g. farmers, farm organizations, retail businesses) should participate actively in the process of providing information and technology.

(Kainaliu, Holualoa and Napoopoo) that represented a cross section of the area. Results of the survey indicated that ants and scale were a serious matter for KFC farmers, especially during May, June and July 1987. Past drought periods could not be correlated to high pest levels.

The analyst learned that KCC was pursuing funding from GACC to clear ant and scale pesticides. In October 1987, UHMCTAHR notified KCC that funds for clearing ant and scale pesticides would be provided via an ant control project on pineapple. The analyst, in consultation with KCC's executive director, had prepared a similar relevant system statement to address this concern - "a system to improve coffee ant and scale control practices and to transfer knowledge about them to people in the situation". She examined the types of transformations mentioned by participants as improvements during the CATWOE process and noted that most had stated that available registered chemicals would be a viable improvement to the situation. The analyst stopped soft systems work on the topic because a technology development methodology was an appropriate approach for developing these control methods.

The analyst learned from the executive director of KCC that KCC had obtained procedures used by the United States Department of Agriculture (USDA) for testing pesticide residues on coffee being imported nationally. KCC brought to the attention of the State Department of Health a Food and Drug Administration (FDA) survey that reported that considerable pesticide residue was eliminated by roasting. No pesticide residue was detected on roasted Kona coffee tested during 1987-1988.

2. <u>Coffee Quality and Marketing Concerns</u>

Farmers often discussed coffee cherry price during Stage Three's interviews because they were conducted at harvest time. The analyst learned that price paid to farmers was based on a coffee cherry grade determined by KFC employee visual inspection and adjusted later according to the percentage of marketable coffee produced. Many KFC farmers complained that the grading process was unfair because grades were inconsistent among similar bags harvested and that no other coffee processors graded cherry.

Many farmers mentioned threat of competitive coffees raised on other Hawaiian islands. Members of the community and KCC's board of directors in particular discussed a Kona coffee marketing order. The analyst learned that the two coffee cooperatives, KFC and PCC, favored the marketing order and probably had the two thirds majority of growers needed to approve it.

3. <u>Farming Assistance Concerns</u>

The analyst was informed by two commodity groups and several farmers that they were quite dissatisfied about the quality and quantity of services provided by UHMCTAHR. Participants told the analyst that the situation was also aggravated because the extension agent took a six month sabbatical during October 1987 - March 1988 and no on-site replacement was provided. She was also informed that individuals had inquired informally about UH Hilo's College of Agriculture's willingness to provide Kona agricultural related services in place of UHMCTAHR.

By the end of Stage Three, participants had spent over one and a half hours with the analyst describing what they saw as possible improvement situations and defining activities that would have to occur in order to actualize their improvements. Outcomes of Stage Three's interviews were 1) relevant system statements outlining functions (Ts) participants stated that were necessary for improvement and 2) root definitions based on the CATWOE mnemonic. Root definitions served as the basis for developing conceptual models of human activities that were organized into entities with systems components during Stage Four.

Stage Four - Developing Improved Situation Models

Using Stage Three's statements outlining improvements, the analyst worked with two subgroups of participants to refine improved system statements. These participants identified key subsystem activities and actors who could be responsible for undertaking activities of an improved state. They then designed human activity system models that addressed 1) farming assistance and 2) coffee quality and marketing concerns. At the end of Stage Four, the analyst identified various inquiry approaches appropriate for addressing several concerns mentioned by participants during Stage Two.

The subgroup that developed a system to improve farming assistance concerns was chosen by criteria described on p. 46. It consisted of seven KFC farmers (including two couples) and seven TT group participants representing various ages, ethnicity, and farmer type. The analyst individually visited each subgroup participant and attempted to arrange joint meetings. Scheduling, however, was difficult and it took approximately two weeks to complete preliminary models.

A. A System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

The analyst began to develop models by examining the transformation statements; in particular, key verbs that participants mentioned during the CATWOE exercise. She grouped verbs describing similar activities and asked participant subgroup members if they were satisfied with these specific verbs that represented improved activities. Sometimes

CHAPTER IV

RESULTS

Stage One - Becoming Acquainted with the Situation

After a visit to Kona in February 1987, the analyst, in consultation with the extension agent, identified a suitable research area and focus. On-site factors that became apparent during Stage One necessitated modifying the original research plan (pp. 4-6). On 1 April 1987, the analyst began her research by 1) becoming familiar with the research area (Kona), 2) identifying and contacting participants for Stage Two's interviews, 3) developing information recording procedures, 4) obtaining background information and 5) developing a formal structure to accommodate the study.

A. Becoming Familiar with the Research Area

The analyst became familiar with Kona's farming practices and cultural setting through discussions with the extension agent and the field representative of the Kona Farmers Cooperative (KFC). She accompanied them on farm field visits during April and May 1987 and became familiar with the geographic area. The extension agent introduced her and her research at several community meetings.

participants found a more encompassing or descriptive verb. Once the subgroup had agreed upon a desired activity, then they determined an appropriate person, group or institution that could undertake the activity. Table 12 identifies key subsystem activities and actors who could be responsible in the future for undertaking each activity for the system to provide information and technology pertinent to Kona's needs (developed in response to farming assistance concerns).

The analyst then illustrated subsystem activities (Table 12) in model form (Figure 21). Subgroup participants provided information about inputs and outputs, information flows and decision making, and the analyst noted these on the visual model. Table 54 and Figure 29 (Appendix D) present subsystem activities and actors responsible and a graphic model for a system to maintain the quality of and market Kona coffee. Tables 13-19 examine the components of the system and its main subsystems. A similar presentation of the system designed to maintain the quality of and market Kona coffee is found in Appendix D.

Upon completion of Stages Six and Seven, the analyst requested comments from four key participants of the TT group (via mail and personal contact) to confirm that the models' activities were needed for actualizing key transformations. Two of these participants finalized inputs, outputs, communication flows and decision making portions of the models. The analyst then compared the models as wholes and each sub-subsystem with the formal system components (pp. 23-24) in order to make sure they could be considered systems models.

Table 12. Subsystem Activities and Actors Responsible in the Future for A System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

Subsystem Activities	Actors Responsible in Future
Comprehending Kona's Situation	
Collecting information (observing on-site physical, biological and human systems)	Farm Orgs, UHMCTAHR, DOA and Farmers,
Describing problems accurately	"
Updating information continuously	"
Evaluating current info/tech characteristics in light of needs and performance	"
Getting and Using Resources Wisely	
Identifying resource needs and sources	UHMCTAHR and Farm Orgs
Cultivating allies (public relations)	Elected Officials
Developing program objectives according to needs	UHMCTAHR, Farm Orgs and DOA
Preparing, presenting and pursuing proposals with donors	"
Hiring staff and securing inputs	"
Planning Information and Technology	
Reviewing all relevant literature (Hawaiian and abroad)	UHMCTAHR, Farm Orgs, and Private Companies
Identifying info/tech plan for small-scale farmers	UHMCTAHR and Farmers
Drafting info/tech plan (including identifying desirable info/tech characteristics)	UHMCTAHR and Engineers/ technicians
Developing Information and Technology	
Obtaining parts and assembling info/ tech (building)	Engineers/technicians
Collecting prototypes/model information (field trials)	UHMCTAHR and Private Companies
Modifying info/tech based on user comments	"

Info/tech = information and technology
Farm Orgs = farm organizations
Field Reps = field representatives of companies/cooperatives

Table 12. (Continued) Subsystem Activities and Actors Responsible in the Future for A System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

Subsystem Activities	Actors Responsible in Future
Educating People	
Identifying and involving key people in the transfer process	Farm Orgs, Field Reps, and UHMCTAHR
Designing, producing and distributing written and visual information (publicity)	UHMCTAHR, Private Companies, and Newspapers
Demonstrating tech (at experiment station and on farms)	UHMCTAHR, Farm Orgs, Farmers, and Private Companies
Distributing samples/new varieties	Private Companies and UHMCTAHR
Clarifying info/tech with on-farm visits	UHMCTAHR and Field Reps
Teaching formal courses at user level	UHMCTAHR and UHHCA
Making Information and Technology Available	
Involving retailers	Private Companies
Producing info/tech en masse	Retail Sellers
Selling info/tech	Private Companies and Consultants

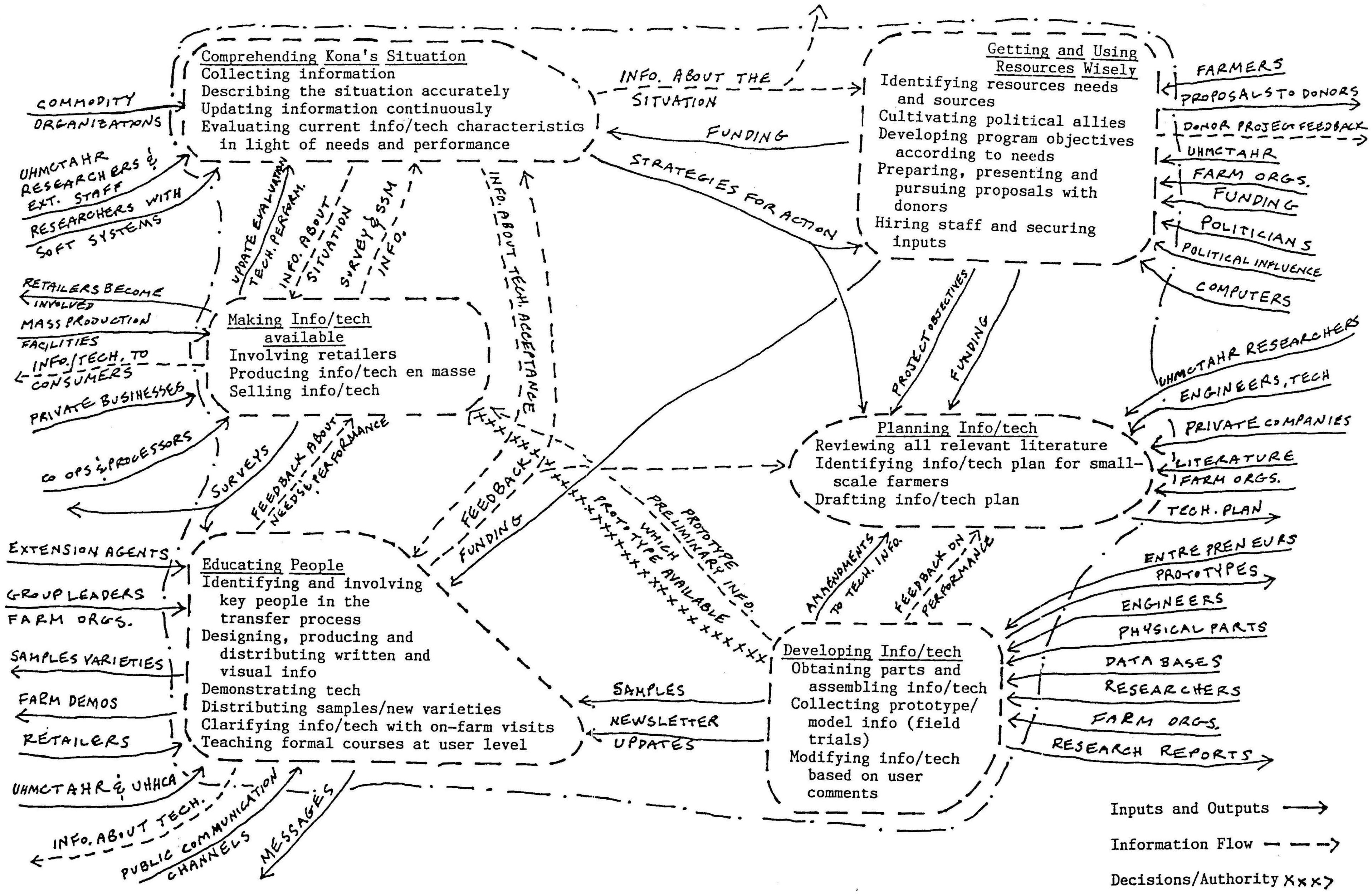

Figure 21. A Conceptual Model of a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

Table 13. Components of a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

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Objective, Purpose, Mission, or Desired Final State

To provide information and technology pertinent to Kona's needs by responding to concerns that there were not enough "answers" or help to improve farming practices in Kona. This system would set up structures and processes that would respond to farmer's questions by providing answers and/or set in motion steps to obtain answers.

Measure of Performance

Farmer satisfaction that something was or is being made available

Subcomponents

1) Comprehending Kona's situation (Table 14),
2) Getting and using resources wisely (Table 15),
3) Planning information and technology (Table 16),
4) Developing information and technology (Table 17),
5) Making information and technology available (Table 18), and
6) Educating people (Table 19).

Interaction (Information Flow)

Each subcomponent will interact with each other as described in Tables 13-19.

Exists in Wider Systems

Although agricultural-focussed, this system would be part of wider community, county, state, national and international systems - e.g.
1) the tourist system brings revenue in to the area but competes for local labor and
2) the natural ecosystem presents environmental constraints which farmers must manage

Decisions/Authority

This system differs from conventional research-extension process because decision making would be shared between UHMCTAHR and the Kona community.
Decision takers would include: researchers, extension personnel, DOA staff, farm organizations, and farmers.

Table 13. (Continued) Components of a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

Resources

1) Human resources (actors) would include: researchers, extension service personnel, DOA and other state organization staff, farm organizations, farmers, retail businesses, consultants, and journalists,
2) Information sources would include former Kona and foreign research, and
3) Funding would be provided by state and private sources.

Continuity

1) State and national assistance for providing information and technology pertinent to farmers' needs is mandated to US Land Grant Universities, including UHMCTAHR.
2) Community organizations would provide support and input because farmers will continuously need updated information and technologies.

Table 14. Components of a Subsystem to Comprehend Kona's Situation

Objective, Purpose, Mission, or Desired Final State

To provide a clear, up-to-date understanding of problematic situations upon which subsequent action could be taken. This would produce joint UHMCTAHR-community understanding of farming concerns. Outputs would be accurate, up-to-date descriptions of the situation, including records of farming concerns and opportunities, and a strategic plan for action.

Measure of Performance

Amount of usable information and technology that would be available to farmers and how much user adoption would occur

Subcomponents

1) Collecting information (requiring on-site observation of physical, biological, and human activity systems),
2) Describing the situation accurately,
3) Updating information continuously, and
4) Evaluating current information and technology characteristics in light of needs and performance.

Interaction (Information Flow)

1) Outputs from this situation (descriptions of the situation's concerns, needs and opportunities) would be communicated to the subsystem dealing with "getting and using resources wisely" and then be communicated into the "planning" subsystem.
2) Feedback from the "making information and technology available" subsystem would flow into this subsystem to assist its updating and evaluation activities.
3) Information created by this subsystem would also flow to farmers, UHCTAHR and other wider systems.

Exists in Wider Systems

Information collected by this system would be integrated into other wider (non-agricultural oriented) systems (e.g. county and state water development plans).

Table 14. (Continued) Components of a Subsystem to Comprehend Kona's Situation

Decisions/Authority

1) Some researchers would examine the physical, horticultural, social and cultural aspects of Kona's environment by employing scientific method, technology development and hard systems-based methodologies. They would decide what additional observations, experiments, technologies or resource allocations would be needed and suggest them to farm organizations and individual farmers.
2) Other researchers and Kona residents with soft systems training would suggest appropriate improved human activity systems based on their work.
3) Farmers and farm organizations, in consultation with, UHMCTAHR staff would make decisions together about appropriateness of the information and technologies based on perceived needs and performance by being participants in the soft systems process. A strategic plan of action would then be prepared.

Resources

1) Human resources would include: someone with soft system training to:
   a) undertake personal interviews because farmers will not attend meetings and
   b) share information about what UHCTAHR and the commodity organizations were doing.
   Other human resources would include a UHMCTAHR on-site tree crops specialist and extension personnel, DOA staff, farm organizations and farmers.
2) A computer would be needed to store and retrieve information.

Continuity

Kona's farmers will continuously face new problem situations and require a means to deal with them.

Table 15. Components of a Subsystem to Get and Use Resources Wisely

Objective, Purpose, Mission, or Desired Final State

To ensure and allocate resources wisely for Kona's agricultural needs.

Outputs would include:

1) Proposals to donor organizations and individuals,
2) Funding to run other subsystems and to support UHMCTAHR and farm organization staff and services,
3) Facilities and other support factors, and
4) Community influence on the political systems outside Kona.

Measure of Performance

Adequate funding to hire on-site personnel so that the wider system could operate in a timely manner to address farming concerns

Subcomponents

1) Identifying resource needs and sources,
2) Cultivating allies via public relations,
3) Developing program objectives according to need,
4) Preparing, presenting and pursuing proposals with donors, and
5) Hiring staff and securing inputs.

Interaction (Information Flow)

1) Information from the "comprehending the situation" subsystem would enable this system to function, especially to assist this system in determining and securing needed financial and human resources.

2) Information concerning the types of proposed information and technology that were lacking (project objectives), financial budgets and work plans, developed in program objectives and proposals sub-subsystems, would be communicated to the "planning information and technology subsystem".

3) Information concerning expenditures, progress at achieving the proposals' objectives, who had been hired, etc., would flow out of the to wider systems (e.g. UHMCTAHR, DOA and the State Legislature).

Exists in Wider Systems

This subsystem would exist in wider systems because outside entities, e.g. political parties, the UH president, donor organizations (state and national governmental bodies and private corporations) and state farm organizations would include Kona's needs in their agenda's and budgets.

Table 15. (Continued) Components of a Subsystem to Get and Use Resources Wisely

Decisions/Authority

1) Staff decisions about developing information and technology pertinent to Kona's needs would be made by the community and UHMCTAHR, in consultation with actors undertaking the subsystem's activities.

2) UHMCTAHR, DOA and other state organizations, farm organizations and farmers would share decision making concerning resource needs, program objectives and preparing, presenting and pursuing proposals.

3) Farm organizations and individuals would primarily make decisions about activating political channels.

4) Day-to-day system activity management would primarily be undertaken by on-site system actors.

Resources

1) Human resources would include: researchers, extension personnel, DOA and other state organization staff, farm organization and farmers. Politicians would assist in marshalling funding (especially for capital improvements), land and other inputs.

2) Computers and telephones would be needed to manage, store and communicate information within and outside the system

Continuity

Community organizations, politicians and UHMCTAHR would provide support because farmers will continuously need updated information and technologies and require resources to run the system.

Table 16. Components of a Subsystem to Plan Information and Technology

Objective, Purpose, Mission, or Desired Final State

To plan viable information and technology suitable for Kona's small-scale agricultural needs.
Outputs would include technology plans outlining possible information and technology products and information systems.

Measure of Performance

Adequate, usable information and technology would be identified and later evaluated to be suited to Kona's particular conditions and farmer adoption would occur.

Subcomponents

1) Reviewing all pertinent literature (from Hawaii and abroad),
2) Identifying an information and technology plan for small-scale farmers, and
3) Drafting the plan (including identifying desirable information and technology characteristics).

Interaction (Information Flow)

1) Information about the desired information and technology (via plans) would flow to developers who would next have the task of "developing" it.
2) Feedback from the "development" subsystem would filter back to this subsystem if and when amendments were needed.
3) Information from the "comprehending the situation" subsystem would periodically need updating and modification from this system.

Exists in Wider Systems

This subsystem would exist in wider systems because information and technology pertinent to Hawaii belongs as part of a wider system of world-wide agricultural information and technology.

Decisions/Authority

UHMCTAHR staff, farm organizations, entrepreneurs, businesses and farmers would be key decision makers of this subsystem.

Table 16. (Continued) Components of a Subsystem to Plan Information and Technology

Resources

Human resources would include: UHMCTAHR staff, farm organizations, entrepreneurs, businesses and farmers needed to undertake the activities of this system (actors). UHMCTAHR researchers would have access to world-wide literature and could assist in identifying and developing technology plans for small-scale farmers. Kona's farm organizations had libraries and farmer surveys which are potential sources of literature and ideas. Private companies in the community would have a role in planning. Engineers (technicians), entrepreneurs, and farmers would be needed to help draft a plan.

Continuity

Farm problem situations constantly change, therefore, demand for new information and technologies is continuing.

Table 17. Components of a Subsystem to Develop Information and Technology

Objective, Purpose, Mission or Desired Final State

To develop tangible products (printed, computerized information or tools) to assist small-scale farmers.
Outputs would consist of prototypes of technologies and preliminary database information systems that would be transferred to the system that would "make information and technology available". Physical samples would be passed to the "education subsystem" for demonstrations.

Measure of Performance

1) The availability, performance and use of information and technology, and
2) Updates for newsletters by and for farmers to communicate the potential of new information or technology. Research papers published about the information and technology could be used in wider systems (e.g. UHMCTAHR).

Subcomponents

1) Obtaining parts and assembling information and technology,
2) Collecting prototype or model information (e.g. field trials), and
3) Modifying information and technology based on user comments.

Interaction (Information Flow)

1) Information about the type of information and technology would be received from the "planning" subsystem.
2) Feedback about the information and technology performance would return to the planning subsystem as well as back to the subsystem in charge of "comprehending the situation".
3) Modifications would be in order if obstacles were encountered during any stage of technology development.
4) As products were being developed, information about them would be sent on to the "educating" subsystem.
5) Information about the product's performance would flow outside the system to wider systems as well.

Exists in Wider Systems

Outputs from other wider systems could be called upon and borrowed to fulfill some of the requirements of this subsystem (e.g. to borrow a database from another state) and this system's information and technology could be assimilated into other systems.

Table 17. (Continued) Components of a Subsystem to Develop Information and Technology

Decisions/Authority

1) Engineers, in consultation with users (individual farmers and commodity organization staff) would make information and technology design decisions.

2) Decisions about how and when to educate people about the forthcoming product would be made by those hired by the "resources" subsystem and actors in the "educating" subsystem.

Resources

1) Human resources would include: engineers (technicians), researchers, interested farmers, and commodity organization staff. Communicators would be needed to describe to people outside the system (donors and consumers) what types of information and technology were available. The "resources" subsystem would provide funding to hire staff and secure inputs required.

2) Technology plans would be major inputs to this subsystem resulting from the "planning" subsystem. Tools and physicals parts (computer components, etc.) needed to build technologies or databases would have to be bought or, if unavailable, fabricated by hand.

Continuity

Once plans that respond to needs have been identified and decided upon, actual product development is necessary. Changing situations require new information and technology.

Table 18. Components of a Subsystem to Educate People

Objective, Purpose, Mission, or Desired Final State

To expose users to what information and technology is available and to educate them in their use.

Measure of Performance

Amount of information and technology which was accepted and used. This information would be evaluated vis-a-vis the soft systems work undertaken by the "comprehending" subsystem and informal communication with users.

Subcomponents

1) Identifying and involving key people in the transfer process,
2) Designing, producing and distributing written and visual information (publicity),
3) Demonstrating technology (at experiment station and on-farm),
4) Distributing samples or new varieties,
5) Clarifying information and technology (with in-store and on-farm visits), and
6) Teaching formal courses at user level.

Interaction (Information Flow)

1) Actors in this subsystem would learn about the potential information and technology from the "developing" subsystem.
2) Feedback from this subsystem would assist those responsible for comprehending Kona's farming problems as well as to those planning to address those problems.
3) Information about appropriateness of communication messages and materials generated by this subsystem would be received from the "comprehending" subsystem. This would provide information to private businesses involved in "making the information and technology available" subsystem.

Exists in Wider Systems

Agricultural education would be made available in conjunction with other educational programs (e.g. UHH's West Hawaii Campus activities).

Decisions/Authority

Decisions about who to involve and how to involve them would be made by extension agents, in conjunction with farm organization staff. They would manage this system and develop appropriate information messages and materials. These would be distributed via the retail sales outlets, farm organization staff, UHMCTAHR extension service office and newspapers.

Table 18. (Continued) Components of a Subsystem to Educate People

Resources

1) Human resources would include: extension agent(s), group leaders, UHMCTAHR and UHHCA instructors, and retailers. They would require a certain level of communications expertise and use public communication channels (e.g. newspapers, radios, etc.) to "get the word out".

2) Samples coming from the "development" and "making" subsystems would pass through this subsystem when being distributed.

Continuity

Users will need education to be able to use new information and technology as it is continually developed.

Table 19. Components of a Subsystem to Make Information and Technology Available

Objective, Purpose, Mission, or Desired Final State

To provide information and technology (products and services) to consumers.

Outputs would include:

1) Actual physical products and
2) Retailers would become integrated as actors in the system to provide information and technology pertinent to Kona's needs.

Measure of Performance

Amount of profit created by the sales (user acceptance) of information and technology.

Subcomponents

1) Involving retailers,
2) Producing the product en masse, and
3) Selling the information and technology.

Interaction (Information Flow)

1) Feedback about consumer's needs and perceptions would flow from the "exposure and education" subsystem.
2) Technical information from UHMCTAHR research and extension staff would be transferred to retailers to assist them in providing consumers with information about the new information or technology.
3) Feedback about the performance of the product (sales and complaints) would reenter the system via the "comprehending the problem" subsystem.

Exists in Wider Systems

Some products and services (e.g. computer repair) would be necessary to support, but be outside the scope of, this subsystem.

Decisions/Authority

1) Decisions about which prototype would be available would be made within the "development" subsystem by technology developers in consultation with farmers and farm organization leaders.
2) Based on the expertise of the "development" subsystem, decisions on producing the prototype would be made within and outside this system by those with capital resources. Decisions from outside the system (e.g. board of directors and consumers) would impact on the amount of interest retailers had, how many products would be produced, and how much would be consumed.
3) Consumers would be part of the system via formal or informal surveys and collected soft system information.
4) The subsystem would be managed primarily by retailers who sell goods to farmers.

Table 19. (Continued) Components of a Subsystem to Make Information and Technology Available

<u>Resources</u> 1) Human resources would include: retail sales companies that would mass produce, distribute and sell products. 2) Production facilities would be needed to turn out the desired amount of physical products. 3) Funding for facilities and advertisement would be needed. 4) Prototypes would be transferred from the "developing" subsystem to this subsystem for mass production and distribution to the consumer.
<u>Continuity</u> Where demand exists, so do retail sales.

B. Other Appropriate Methodologies

At end of Stage Four, the analyst examined themes of concern described during Stage Two in light of inquiry approaches other than soft systems. The analyst trained the KFC field representative how to undertake a telephone survey concerning coffee ant and scale damage levels and assisted in the preparation of the survey's results to provide UHMCTAHR data. Subsequently, UHMCTAHR scientists employed the technology development approach for clearing pesticides for coffee ants and scale.

The following discussion presents other concerns identified by the analyst which continued to be pressing during 1987-88 based on her discussions with participants. The analyst determined that some concerns required the following inquiry approaches.

1. Effects of the Volcano

The analyst recommended basic scientific inquiry to examine, quantify and develop possible avenues for coping with the physical effects caused by Kilauea's continued eruption. She became especially interested in the volcano's effects on photosynthetic rates, flowering, and plant nutrition. The local newspaper reported in June 1988 that the Department of Health had begun investigation examining cistern water contamination. It was reported that high levels of lead were found in some cisterns constructed of materials containing lead and could corrode due to acid rain conditions brought on by volcanic emissions.

2. Land Leases

KFB requested that the analyst facilitate a visit by a consultant interested in utilizing soft systems methodology to identify feasible and desirable improvements in the leasehold land situation. KFB members also requested collecting survey data about Kona's farming situation.

3. Soils

The analyst recommended basic science research and technology development approaches for examining management strategies for Kona's rocky soil conditions. She recommended that studies addressing long-term herbicide, pesticide and acid forming fertilizers on low pH soils needed undertaking.

4. Coffee Yields

The analyst recommended scientific investigation of possible causes for coffee yield decline including the effects of limited lime and fertilizer use, nematode infestations, continued herbicide use, age of trees (some orchards were over 100 years old), undesirable pruning methods and long-range climatic changes.

5. Coffee Propagation

The analyst noted that most farmers used pulapula to propagate coffee despite UHMCTAHR extension recommendations to start coffee seedlings in nurseries for later transplanting. She recommended that on-farm trials, including examining crop establishment methods (e.g. one row of seedlings from bags verses another of pulapulas) and the cost of employing each practice (labor and time), were needed. These trials would evaluate both methods and assist the extension service and

KCC in promoting superior methods, including sponsoring on-farm field days.

6. Weeds

The analyst learned from farmers that they used the herbicide Round-up to keep the ground beneath coffee plants weed free because coffee feeder roots lie close to soil level. She recommended that investigations into the effects of the current clean culture method, different ground covers, nutrient cycling, and herbicide damage were needed.

7. Kona Coffee Characteristics

Some participants stated that it would be beneficial to determine if Kona coffee had a distinctive chemical component which gave it its excellent taste.

8. Undefined Macadamia Nut Concerns

The analyst recommended that research was needed addressing the following production problems: June nut drop, sticktight, and dieback.

9. Rodents

Coffee, avocado and macadamia nut farmers complained to the analyst about rats. The analyst recommended that macadamia processors, HMNA, DOA, farmers and the cooperative extension service needed to discuss development of a community-wide program for rat control, which might involve designing a human activity system.

10. Avocado Varieties

Commercial avocado producers, those interested in avocados for home consumption, and UHMCTAHR personnel continued discussing lack of marketable summer avocado varieties. The analyst recommended that evaluation of new varieties was needed throughout Kona including distribution of scion wood to interested growers who would participate in data collection about performance and farmer preference.

C. Summary of Stages Three and Four

During Stages Three and Four, the analyst helped participants to 1) describe visions of improved states that would alleviate their concerns, 2) formulate precise statements outlining the necessary transformations occurring in these improved states, 3) complete transformation statements to describe components of the improved states, and 4) design conceptual models of improved human activity systems operating in improved states in order to achieve the desired transformations. She examined and recommended appropriate research activities for themes of concern which required various inquiry approaches.

<u>Stages Five and Six - Comparing Models with the Present Situation and Debating Feasible and Desirable Changes</u>

During Stages Five and Six, the analyst discussed the two conceptually-modeled systems addressing farming assistance and coffee quality and marketing concerns that had been developed by Stage Four's subgroups with as many participants as possible (70% and 79% of the original KFC farmer and TT group participants respectively). She asked TT group members, especially commodity association leaders, to verify the updated rich pictures that had been developed during Stage Three (pp. 123-127). During Stage Five, participants compared activities envisioned by these human activity system models with information about the actual situation that had occurred since the study began in April 1987. During Stage Six, participants developed and debated proposals for change based on their feasibility and desirability.

During Stages Two and Three, farmer participants told the analyst that they did not attend group meetings. The analyst, therefore, personally visited participants during Stages Five and Six. Interviews were delayed for nearly half of the participants (especially KFC farmers) because of conflict with harvest season activities. UHMCTAHR participant interviews were delayed or cancelled because of travel and research activity conflicts. The interview period lasted over two and a half months.

Two KFC farmers and three TT group participants who had helped design Stage Four's models initially filled in comparison tables (pp. 151-157 and pp. 285-292, Appendix E). Wording of these tables was

Table 20. Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

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Stage Four Model Subsystem Activity
Getting and Using Resources Wisely

Present Existence of Activity
Yes, but needs a boost

Present Mechanism by Which Activity Exists
1) IAP
2) Farm organization direct appeals to the GACC, DOA, State Legislature and UHMCTAHR

Present Activity's Measure of Performance
If adequate funding is received in a timely manner to provide on-site research and if/how problems are addressed

Proposed Activity Change
Proposal One:
UHMCTAHR, farm organizations and elected officials work to provide on-site research personnel:
1) Hire a tree crops agriculturist,
2) Expand the graduate student program,
3) Provide a full-time agricultural technician,
4) Secure other team members' time, and
5) Secure facilities, support staff and other inputs (see narrative - p. 161).

Comments Relating to Current and Proposed Activities
1) There's a general feeling that UHMCTAHR is not meeting Kona's needs adequately.
2) Current staff and resource levels don't reflect Kona's needs due to population growth. There's one extension agent for all Kona's crops, researchers visit Kona one-two times per month and only short term agricultural technician funding is available.
3) Kona's environment is different, needing on-site research.
4) Farm organizations separately work on needs arising between IAP's.
5) Funding sources could include: private sources (marketing orders), legislative bills sponsored by farmer organizations, UHMCTAHR staff reallocations and Hawaii County funding.

Table 20. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

Stage Four Model Subsystem Activity
Comprehending farmers' problem situations

Present Existence of Activity
Yes, but could use improvement

Present Mechanism by Which Activity Exists
Farmers farm organizations communicate the area's concerns to UHMCTAHR via IAP and/or extension service

Present Activity's Measure of Performance
Progress on identified IAP bottlenecks

Proposed Activity Changes
Proposal Two:
UHMCTAHR and farm organizations to improve this activity by adding Agricultural Systems Methodology (the application of soft systems to complex, multiinstitutional agricultural problem situations) to IAP to examine information and technology in light of needs and performance.

Proposal Three:
IAP people should meet more frequently.

Proposal Four:
Farmers should continue dialog with UHMCTAHR between IAP's.

Proposal Five:
UHMCTAHR and farm organizations should increase publicity about perceived problems.

Comments Relating to Current and Proposed Activities
1) A large number of Kona's farmers are disengaged (do not attend extension service or farm organization meetings). IAP's may over look them.
2) IAP's can not be updated quickly.
3) As new information and technology is developed, all parties should be involved in examining it in light of needs and performance.

Table 20. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

Stage Four Model Subsystem Activity
Planning information and technology

Present Existence of Activity
Somewhat

Present Mechanism by Which Activity Exists
1) Farmers and farm organizations undertake activity with UHMCTAHR and private businesses
2) UHMCTAHR internal planning

Present Activity's Measure of Performance
Amount of information and technology that is identified and evaluated

Proposed Activity Changes
Proposal Six:
UHMCTAHR to focus on:
1) New crops for Hawaii
2) Existing diversified crops for small-scale farmers.

Comments Relating to Current and Proposed Activities
This may require a UHMCTAHR policy decision or legislative mandate about whether UHMCTAHR serves farmers on an acreage or numbers basis or both.

Table 20. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

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Stage Four Model Subsystem Activity
Developing information and technology

Present Existence of Activity
Yes

Present Mechanism by Which Activity Exists
1) Private enterprises
2) Limited UHMCTAHR involvement

Present Activity's Measure of Performance
Availability and performance of information and technology

Proposed Activity Changes
Proposal Seven:
UHM Agricultural Engineering Department (UHAED) and the retail sector should be involved more.

Proposal Eight:
UHMCTAHR and farmers to undertake and follow up more on-farm research.

Comments Relating to Current and Proposed Activities
1) There is limited on-site UHAED involvement presently.
2) Retailers could provide inputs and collaborate on joint projects.

Table 20. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

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<u>Stage Four Model Subsystem Activity</u>
Educating people

<u>Present Existence of Activity</u>
Somewhat

<u>Present Mechanism by Which Activity Exists</u>
1) Extension agent and farm organizations' field representatives visit farms
2) Farm organizations have field days

<u>Present Activity's Measure of Performance</u>
Amount of information and technology that is used

<u>Proposed Activity Changes</u>
Proposal Nine:
UHMCTAHR and farm organizations to upgrade and plan activities: brochures, videos, demonstrations, on-farm trials, classes, experiment station open houses, etc.

Proposal Ten:
The extension agent should keep a log of concerns, undertake group activities, and involve the retail sector.

Proposal Eleven:
UHMCTAHR should publish a newsletter highlight every six months.

<u>Comments Relating to Current and Proposed Activities</u>
1) Resources are currently limited, especially extension service resources. There is only one extension agent for all of Kona's crops.
2) Practical adult education is being requested.
3) Most people in Kona haven't any idea about what UHMCTAHR is doing.

Table 20. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Provide Information and Technology Pertinent to Kona's Agricultural Needs

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Stage Four Model Subsystem Activity
Making information and technology available

Present Existence of Activity
Yes

Present Mechanism by Which Activity Exists
Private companies, consultants, and retail outlets sell goods and services

Present Activity's Measure of Performance
Sales

Proposed Activity Changes
Proposal Twelve:
See Proposals Seven and Ten above.

Comments Relating to Current and Proposed Activities
Demand exists for information and technology but products do not due to lack of information and technology

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amended based on information provided by three other KFC participants interviewed early during Stage Five and Six activities. They were in their final form after one third of the participants were interviewed because participants provided the analyst new information in a snowball fashion; one interview building on the next.

Previous soft system stages were reiterated during Stages Five and Six. For example, farmers stated that they were concerned about activities associated with coffee quality and, grading in particular. Some informed the analyst of how the activity was done (Stage Two activities); others provided possible improvements that might exist (Stage Three activities) and still others discussed change strategies that were needed (Stages Six and Seven activities).

Table 20 presents Stage Five and Six's participant information about a system to provide information and technology pertinent to Kona's agricultural needs; a similar one addressing coffee quality and marketing concerns is presented as Table 64 in Appendix E. These tables present information collected during Stage Five based on discussion of Stage Four model subsystem activities: 1) if they currently existed, 2) the present mechanism by which they existed, 3) their current measure of performance, and 4) comments related to current and proposed activities.

Tables 20 and 64 also present Stage Six proposals, which were developed and debated by participants. The analyst recorded the exact proposal wording that participants suggested. Two proposals for change were added during the course of the interviews based on suggestions from two TT participants. Others had multiple options that emerged during the debate process. For example, three methods for grading coffee were suggested by KFC participants (using mechanical sorters, grading samples by hand, or visual inspection, "eyeballing" coffee cherry as it was delivered). The analyst included all three options as proposals for change to gather more information for assisting KFC's management in improving KFC's grading procedures. While discussing Proposal Two of the information and technology provision system, five KFC farmers specifically suggested ways that UHMCTAHR and farm organizations could upgrade their activities. Two TT participants stated that it was the responsibility of farmers to make IAPs work by attending meetings. The analyst noted that this proposal suggested a different worldview that was contrary to that of the majority of participants and could have warranted inclusion in a different Stage Four conceptual model had it been developed. She included it as a proposal for change which was debated by all participants. If it turned out that it was feasible and desirable, a return to modeling efforts (Stage Four) would have been in order. The analyst retained proposals that had little support throughout the debate to allow all participants opportunity to hear and debate them.

After the first five interviews it became apparent to the analyst that the first two proposals had to be more fully explained than other proposals because of their breadth, scope and new terminology. Originally the analyst began the interview by discussing the "comprehending Kona's situation" subsystem, however, after several visits it became apparent to her that it was necessary to discuss the "getting and using resources" subsystem first. She noted that participants needed to understand that on-site personnel who would be doing the "comprehending" activities were proposed for improving "getting and using resources" activities. Table 21 presents a narrative of Proposal One developed by the analyst.

The analyst went through Tables 20 and 64 with each participant and briefly mind mapped their verbal responses regarding each proposal's organizational, cultural, technical and economic desirability and feasibility (pp. 33-34). Often participants responded with visual rather than verbal answers, which could not be reported herein because she did not have a method of recording participant gestures. She also did not have a means of recording the intensity of participant reaction to each proposal, except what their vocabulary reflected. After all the proposals were discussed, some participants, especially those who had assisted in Stage Four activities, stated that they wholeheartedly supported them all. The analyst recorded whether participants verbally favored or did not favor each proposal. The analyst noted that the first two subsystems and their proposals were most extensively discussed and earned the most verbal support as reflected in Table 22. A similar table (Table 65) is presented in Appendix E for the system to maintain the quality of and market Kona coffee.

Tables 23-44 and 66-100 (Appendix E) present KFC farmer and TT group statements recorded by the analyst's mind maps. The analyst inserted a minimum number of words to make sentences full or to word the sentence so that respondent identity remained confidential. The reader should note that when participants referred to "UH", they meant UHMCTAHR. Participants did not mention UHH.

Table 21. Narrative of Proposal One to Provide On-site Research Personnel

Kona (West Hawaii, in general) is one of the fastest growing areas in Hawaii, yet current resource levels and procedures do not reflect these changes. The present number of staff, support staff and facilities limit the amount of information and technology that can be developed and transferred. An on-going mechanism is needed to understand Kona's situation and then provide expertise to meet farmers needs.

One means to meet these needs would be to develop a multidisciplinary, farming systems approach. Team members could include:

Team Leader - A tree crops agriculturist with training in Agricultural Systems Methodology (soft systems analyst) for crop and production and ground cover maintenance, who could also collect and organize baseline data.

Economist/Marketing Specialist - to provide cost/benefit analysis of proposed information/technology as well as to provide market development expertise.

Soils/Irrigation Specialist - to provide information pertaining to erosion, irrigation, fertilizers and liming.

Plant Protection Specialist - to develop ecological approaches to reducing production losses (macadamia dieback, ants and scale, rats, etc.).

Graduate students could be supervised in undertaking relevant on-farm research. A full-time agricultural technician would be needed to assist the team.

The entire focus of the team would be to produce desirable and feasible information and technology for farmers, therefore professional advancement (promotions) would be determined based on outputs produced to achieve this goal. Farm organizations could participate in personnel selection and evaluation of performance as well as be housed with the team.

Funding sources could be:

1. Private sources - e.g. via marketing orders, but probably not possible until 1989,
2. Legislative appropriations via bills sponsored by Kona's farm organizations - for short term funding,
3. Reallocation of UH resources - especially as older faculty members retire, and
4. County facilities and inputs.

Budget items could include:

1. Salaries and benefits for staff and
2. Operational expenses (facilities, computers, supplies, travel, etc.).

Table 22. Percent of KFC Farmer and TT Group Participants Verbally Favoring and Not Favoring Proposals for Change

Proposal Number	Percent of KFC Farmers Verbally Favoring	Percent of KFC Farmers Verbally Not Favoring	Percent of TT Group Verbally Favoring	Percent of TT Group Verbally Not Favoring
1	95	0	68	29
2	94	0	66	21
3	60	19	50	32
4	19	48	47	16
5	48	3	47	0
6	71	2	79	3
7	74	6	53	8
8	77	0	71	5
9	68	6	53	18
10	77	0	50	0
11	66	0	53	11

A. Participant Debate

1. Proposal One

Tables 23 and 24 present comments recorded by the analyst of KFC farmers and the TT group pertaining to providing on-site research personnel. All KFC farmers who discussed the proposal stated that they favored it, however, three participants expressed some reservations about the proposal's technical and economic feasibility. The analyst noted that the TT group was divided, primarily along the lines of those with farming verses those with research backgrounds. Of the six participants interviewed that worked for UHMCTAHR, 50% did not favor the proposal, rather stated that the capacity of the extension service in Kona should be increased. Only three participants living in Kona did not favor the proposal.

Table 23. KFC Farmer Statements About Proposal One to Provide On-site Research Personnel and Assistance

Organizationally Desirable

1) Self-serving bureaucratic organizations tend to be headquarters focussed.
2) UH should come to farmers.
3) Research is not trickling out at present.
4) Now farmers don't know what's going on.
5) The present system doesn't work, so try a different approach.
6) It's a good move for farmers and the University to work together.
7) An agricultural swat team would be great!
8) A team idea is good because support from other staff (outside Kona) is good.
9) The extension agent is over worked, always "on the run", and difficult to contact.
10) A specialist could contact farmers which would involve farmers directly.
11) The experiment station should have a station manager again.
12) People in Hilo (East Hawaii) have preferential treatment.
13) West Hawaii has been neglected too long, therefore, any help would be appreciated.

Culturally Desirable

1) Guys from Mainland talk too "high science".
2) There should be someone stationed here (a "local boy") long term, like in the time of Drs. "X" and "Y".
3) Follow-up is important.

Technically Feasible

1) Kona is area that grows most tree crops (in Hawaii), therefore an on-site team is good.
2) Farmers raise more than one crop at a time in Kona.
3) (We) Need somebody with good (appropriate) knowledge, especially for new farmers opening up land.
4) If researchers live in Honolulu, then their research in Kona will not be good.
5) Although the farming systems approach sounds like a good idea, it may not work (skeptical).
6) Farmers may not be in a position to experiment as it takes years.
7) It depends if the team will do its job, it is worth it. They need to hear from the farmers.
8) Why have an extension service if nobody's producing results?

Table 23. (Continued) KFC Farmer Statements About Proposal One to Provide On-site Research Personnel and Assistance

Economically Feasible

1) It would be great to have someone here but is it cost effective considering the mission of the University is to cover state priorities? Perhaps on-site personnel would be serving the local community too much. Spending in government may not be fair share, therefore, private business should fund research.
2) Industry is not contributing enough and should ask for more money but currently feels bad.
3) Don't ask farmers to individually fund research. A marketing order, however, could fund such activities.
4) Eventually it (research) should be funded by growers. Farmers, however, need to make noises at the top level (governor) for temporary funding because it is necessary for their long term survival.
5) Costs should be low for farmers.
6) There are many part time farmers in Kona.
7) It will be difficult for industry to marshal funds, therefore suggest a combination of private funding to be matched by government funding. It never hurts, however, to ask for full funding.
8) The University and community should investigate getting federal funds.
9) A reallocation of UH resources would be economical.
10) UH has had limited resources for a long time. Graduate students could come more often and do projects in Kona.
11) Graduate students are cost effective.
12) State and County budget surpluses could be used to fund personnel in West Hawaii.

Table 24. TT Group Statements About Proposal One to Provide On-site Research Personnel and Assistance

Organizationally Desirable

1) Kona needs full time, on-site tree people. Currently people are stretched too thin and need to come to Kona 3-4 times per week to try to stay in touch.
2) A team could set priorities by being in contact with farmers.
3) The team must cooperate with farmers. If they work by themselves at the experiment station, farmers won't know what they're doing. Farmers won't get involved.
4) All of West Hawaii is growing. Don't limit the team to Kona.
5) UH doesn't bother with facts. The world's a lab. Kona needs somebody to run experiments here.
6) It doesn't matter if they move the college to Hilo. It might be easier to work with them.
7) At the start one person should be allocated (to Kona).
8) Other areas of the state also feel that the University is not meeting their needs adequately. Kona should not get special attention. It is not desirable from the State's perspective to split researchers into one or two person teams.
9) Assigning people to one area is poor utilization of resources.
10) A tree crops person needs to help the state because of the University's mandate.
11) The need in Kona needs to be pointed out to the University, however, Kona is not big enough to warrant its own team.
12) Tree crops research should be left to individual researchers. They should make sure they have time to work on Kona's problems.
13) Part time staff is needed. UH has research underway, however, Kona is not making full use of its services.
14) Another extension agent is needed badly in Kona.
15) Including the farm organizations in personnel selection and evaluation is dangerous territory.

Culturally Desirable

1) Research is unnecessary until Kona deals with its other problems (e.g. marketing).

Technically Feasible

1) Kona has a different environment. It's the only place that raises coffee and avocados.
2) By far the biggest problem is that everybody needs information but it is currently not available.
3) The farming systems approach is needed. It really fills in what is missing - never knew about it.
4) A team program is in great need. The University should reach out to the Mainland and put to use information developed there.
5) The experiment station doesn't have enough land.
6) The team needs a sociologist - a "people person".

Table 24. (Continued) TT Group Statements About Proposal One to Provide On-site Research Personnel and Assistance

Technically Feasible

7) On-site research defeats purpose of critical mass essential for good research.
8) Sometimes ideas by farmers are limiting. Leave the research to researchers.
9) Very few in-state fruit science applicants are available for the position.
10) One full time researcher in Kona would have to also be made into a super extension agent. There would not be enough time for in-depth research.
11) An APT (agricultural technician) is needed to help researchers do their research. The University could use more staff.

Economically Feasible

1) Cost-wise it will produce more than it will consume. It is definitely economically feasible.
2) Trying to stay in touch currently is costly because of airline ticket prices.
3) Getting funding will be difficult.
4) Other groups compete for public funds.
5) Resources are needed not just for agriculture in Kona.
6) It would take a reallocation of existing resources to problem areas that have been neglected.
7) A team would be lovely, but the State's willingness to pursue such a program when it's been cutting back neighbor island assistance (is not probable).
8) Decisions to increase staff in Kona should be county wide decision, unless Kona agricultural organizations are willing to pay for salary and benefits of the person every year.
9) A reallocation of UH resources would not be so bad.
10) UH won't reallocate voluntarily and the agricultural organizations won't be able to fund (research) in short term (maybe in the next five years). The legislature is more logical.
11) There is a need to be realistic about funding, including an estimate of the cost of this proposal and priorities established. An estimate of the income a marketing order would generated is needed. Private research is very cost ineffective.
12) The marketing order won't get enough money to fund basic research. Big business is a good source. A state comptroller who is objective should over see ways to spend funds.
13) If farmers agree to marketing order, funding will be easy, but will raise the current assessment possibly by three times?
14) Marketing orders are best way to raise funds, however, legislative bill support is also good.
15) It is cheaper to move person around rather than be stationed in Kona. That way state-wide support will result.

2. <u>Proposal Two</u>

Participant responses to the proposal for the addition of Agricultural Systems Methodology (the application of soft systems analysis to complex, multiinstitutional agricultural problem situations) to the IAP are presented as Tables 25 and 26. All KFC farmers discussing this proposal favored it. Many farmers discussed Proposals One and Two together with the analyst. The analyst noted that their discussion concerning the first proposal's economic feasibility also applied to funding the second proposal. Twenty-one percent of the TT group participants did not verbally favor this proposal as well as the first proposal.

3. <u>Proposal Three</u>

This proposal suggested that the Industry Analysis Program should occur more frequently. Sixty percent of the KFC farmers stated that IAP's should be held more frequently; one farmer said that it was better than nothing. Nineteen percent questioned if the entire process was worthwhile. Nineteen percent of the TT group, especially those involved with IAP's (e.g. commodity organization leaders), did not verbally favor convening IAP's more frequently because of technical and economical feasibility points that were raised. Tables 27 and 28 present participants' responses to Proposal Three.

4. <u>Proposal Four</u>

This proposal was added because three participants (16%) stated that farmers were not holding up their end of the IAP process by continuing to voice their concerns to UHMCTAHR either directly or to the extension agent. Tables 29 and 30 present participants' responses

Table 25. KFC Farmer Statements About Proposal Two to Add the Agricultural Systems Methodology (Soft Systems) to the IAP Process

Organizationally Desirable

1) Problems kill us in between IAPs.
2) Agricultural Systems Methodology (ASM) is good because three years is too far apart for IAP's.
3) Maybe it's a little humbug for the Department (University).
4) It's hard to hold meetings. ASM is fine.
5) Everybody's got problems, but in a meeting, nothing gets accomplished, so one needs to be on a 1 to 1 basis.

Culturally Desirable

1) ASM is a much more efficient means of communication than people going to meetings. People have given up on going to meetings. (They won't go) just to satisfy the University. Farmers don't express themselves well in group meetings.
2) The biggest problem is that people don't go to meetings. ASM is a very good idea because it gets somebody here to go out to the farmers.
3) ASM is better than meetings because it provides a positive connection.
4) Kona people never come out. They're just like that.
5) Individually farmers will speak what they think, but at meetings, they won't because they don't have education.
6) ASM is especially good with the Japanese who won't speak out.
7) ASM is probably more effective than IAP because farmers don't leave their farms.
8) Many farmers are too old to drive. It's hard for them to see and parking is a problem so they don't attend meetings.
9) The University has to contact people (go and explain their programs). For some guys it (ASM) is better than sending a letter.
10) The University needs to accumulate knowledge of the district and to work with people by using their hands. They need to spend a lot of time with people, it can't be done overnight.
11) Frankly Kona is neglected. There's no communication and nobody comes here.
12) There is not whole (much) communication between the University and farmers.
13) Frankly if the University would play ball, then it would be ok, but they never come around.
14) Communication is good. Kona doesn't have much with the University.
15) I strongly support ASM because somebody cares.

Table 25. (Continued) KFC Farmer Statements About Proposal Two to Add the Agricultural Systems Methodology (Soft Systems) to the IAP Process

Technically Feasible

1) ASM is a very useful process. The IAP is very shallow and usually does not involve over 15 - 20 people. There is a need to have to use a random sample because orientals won't come forth. One needs to dig them out privately. The (IAP) analysis is flawed because the old timers aren't as vocal as the new farmers.
2) IAP priorities do not properly represent the farmers.
3) When you go out and random sample, you get a better cross section. This method is better.
4) IAP is a good process but needs lots of back ups.
5) IAP sounds inadequate. The academic way is not where it is. The University's services are not good.
6) ASM might be difficult because one person must go around and visit farmers. Ways to help the process go smoother (e.g. notify the farmers of the analyst's pending visits) should be investigated.

Economically Feasible

1) IAP is not cost effective because it's not working. The "working on it" enthusiasm is not good. Farmers experience "burn out" and drop out of the process.
2) Lots of farmers over here in Kona are part-time farmers and don't know about funding.
3) The decision making powers need to allocate more funds to comprehending Kona's needs.

Table 26. TT Group Statements About Proposal Two to Add the Agricultural Systems Methodology (Soft Systems) to the IAP Process

Organizationally Desirable

1) An ASM team is desirable because it provides another body for direct farmer contact.
2) ASM is valuable to let the extension agent know the needs of the people.
3) IAP needs to be updated because two years from now something new might be important.

Culturally Desirable

1) People feel the IAP is not worth their time. People who come from Honolulu don't know the problems. They should send people to listen to the problems and ask farmers how to solve them. A lot of farmers won't go to the experiment station.
2) Farmers have lost interest in supplying UH results. (information).
3) The ASM procedure is like the olden days when Drs. "X" and "Y" would visit farmers and ask about farming problems.
4) ASM gives everybody a chance to participate.
5) This ASM was worthwhile as it is one of the few ways to get farmers' opinion.
6) The IAP is adequate. Farmers have their responsibility to speak up. The University can't identify everybody. A random sample is not necessary to do the work that farmers should do.
7) IAP is more democratic than most systems of priority setting and it currently utilizes ASM plus more scientists. A better visiting mechanism could be developed.

Technically Feasible

1) ASM is a shot in the arm for University people.
2) Farmers have to believe that IAP is a sound tool. It's a problem of perception, which is the biggest thing to work on.
3) The application of this methodology produces more reliable results because of scientific sampling than IAP.
4) ASM makes the University more sensitive to others (people and groups) and reaches into disengaged groups. UH should not be dealing with commodities but human beings.
5) The IAP is inadequate and produces a biased picture because they are UH personnel paradigms.
6) If a dozen people were picked who know what they're doing, they could follow up IAP's and come up with ideas.
7) Farmers can't have it both ways. They must participate to make their needs known. The University is short of crystal balls.

Table 26. (Continued) TT Group Statements About Proposal Two to Add the Agricultural Systems Methodology (Soft Systems) to the IAP Process

Economically Feasible

1) Disengaged farmers feel out of reach. These farmers pay taxes to receive such a service. ASM is interaction, more participation.
2) ASM will allow dollars spent to produce better returns.
3) ASM is good, but what is the cost of collecting the information?
4) The IAP dovetails with the legislative budget. ASM would need to be included in the budgetary process.
5) IAP's should be privatized to avoid prejudices, e.g. UH biases.

Table 27. KFC Farmer Statements About Proposal Three to Convene IAPs More Frequently

Organizationally Desirable

1) IAP's are needed more frequently as they are too slow.
2) Three years is too far apart for IAP's. So much can happen.
3) KFC has an annual meeting, why not the IAP?
4) IAP's are good but takes time to get wheels rolling.

Culturally Desirable

1) IAP sounds inadequate.
2) IAP does not properly represent the farmers.
3) IAP provides feedback to the farmer.
4) It's a good idea, but farmers won't go.
5) It's a waste of time. People don't go out at night.

Technically Feasible

1) The amount of farmers participating now is small.
2) IAPs must get farmers in order to undertake a complete project. Participation depends on the seriousness of the problem.
3) The problem of ants has to be handled right away.
4) I've never seen or heard of the IAP. They (UH) must go to the large farms.

Economically Feasible

1) More frequent IAP's are needed but every year would mean a lot of red tape and expense.
2) The University should come back every year to check on things. That's what they get paid for.
3) If it doesn't work every three years, it doesn't pay to just go to meetings.

Table 28. TT Group Statements About Proposal Three to Convene IAPs More Frequently

Organizationally Desirable

1) It is highly desirable to get IAP people together more frequently.
2) Getting together maybe once a year would be good, but not every six months. That would result in overkill.
3) It would be nice to have access more often to funding.
4) The county agent can go out and observe and bring concrete data to the attention of the researchers. He can get the information together every six months.
5) It would add another layer of crap.

Culturally Desirable

1) At least an annual update is needed, maybe every six months.
2) Two years from now something might come up. IAP's are too far apart.
3) It's a good idea to have one every six months if the people come prepared.
4) The IAP people should tell us what's going on by getting together every year and they should keep to the priorities.
5) Problems arise quicker than IAP's. IAP's don't respond to emergency situations.
6) The problem is they don't meet often enough to update problems. Farmers need to know what information exists and how to get it.
7) Farmers should get results every time when something's important (even contacting them two times per month).
8) There's no point in updating more than every three years. Farmers need to continue dialog (Proposal Four) but they feel their part is done once the IAP is finished.

Technically Feasible

1) Who calls the meetings? Who delegates responsibility? The commodity president can talk directly with the researcher.
2) IAP's are so bad and need changing but they're better than nothing.

Economically Feasible

1) Who pays for this?
2) It seems to be duplication of the farm organizations' tasks. They collect fees and should be addressing the problems between IAP's.
3) What has the IAP done for me? I'd like to see how much money is spent on IAP's.

Table 29. KFC Farmer Statements About Proposal Four Suggesting That Farmers Should Continue Their Dialog With UHMCTAHR Between IAPs

Organizationally Desirable

1) The dialog will continue if farmers have on-farm UH experiments, if there's shared results on problems solving and much more.
2) Farmer dialog won't continue on its own unless some vehicle is provided. Maybe the Coffee Council can do it.
3) How many farmers talk at meetings? Ten percent.

Culturally Desirable

1) Most farmers are individualistic.
2) The problem is even if one goes to the Council, will they listen?

Technically Feasible

1) To complete the project (IAP), you must get the farmers.
2) The hardest thing is to get farmers to go to meetings. It's not feasible to expect them to participate.
3) Farmers don't go to meetings. They won't drive.
4) There's a million reasons why people don't go to meetings (conflict of farm and work or they don't feel comfortable).
5) Old farmers can't put into words what they mean.
6) Meetings are with very few people and the same people dialog.
7) Lots of farmers won't go to meetings. It takes time. Many are retired with no energy.
8) It's a waste of farmers' time and it takes them away from work.
9) Forget about it. Farmers won't help.
10) Farmers have been doing that.

Economically Feasible

There were no comments pertaining to economic feasibility.

Table 30. TT Group Statements About Proposal Four Suggesting That Farmers Should Continue Their Dialog With UHMCTAHR Between IAPs

Organizationally Desirable

1) Farm associations are supposed to do that.
2) Each commodity organization should review its IAP annually to determine their progress.
3) Reports from UH specialists to commodity groups are necessary.
4) The extension agent should go out and observe, then come in with concrete data to researchers.
5) The UH has to tell farmers what's happening.
6) Without staff people in the community, it doesn't make sense. The outer islands get little attention. Extension agents need time management training.

Culturally Desirable

1) Locals don't show up at meetings. It's the nature of Kona.
2) Older Japanese are cautious about sharing information. They acknowledge "experts" in their culture. They need to benefit too.
3) There needs to be dialog. Farmers feel their part is done when the IAP is through.
4) People don't do it until it's late. The response time is too slow.
5) Sure that would be good, as long as you come up with the answers.

Technically Feasible

1) A lot of meetings are not feasible.
2) Only 30% of the farmers will bring questions. Seventy percent won't go out of their way.
3) Only a few vocal farmers participate. Most feel different.
4) It's part of the assessment process.

Economically Feasible

There were no comments pertaining to economic feasibility.

to Proposal Four that suggested that farmers should continue their dialog with UHMCTAHR between IAPs. Forty-eight percent of the KFC farmers and 16% of the TT group participants questioned if this was feasible because farmers won't attend or speak up at meetings. Forty-seven percent of the TT group participants verbally favored this proposal.

4. Proposal Five

Tables 31 and 32 present comments recorded by the analyst about whether UHMCTAHR and farm organizations should increase their publicity about perceived problems. Only 3% of the KFC farmers did not verbally favor this idea stating that it would be too costly. Forty-seven percent of the TT group participants spoke in favor of the proposal.

5. Proposal Six

Tables 33 and 34 present responses recorded by the analyst regarding whether UHMCTAHR should focus on new crops for the state and existing diversified crops for small-scale farmers. Fifty-two percent of the KFC farmers specifically stated that UHMCTAHR should focus on assisting small-scale farmers. Another 19% stated that UHMCTAHR should serve both large and small-scale farmers. The analyst noted that discussion on this proposal varied within the TT group. Thirty-seven percent of these participants stated that UHMCTAHR should work for both large and small-scale farmers and eight verbally favored expanding a small-scale/diversified focus. Twenty-one percent of the participants, composed of UHMCTAHR staff, told the analyst that UHMCTAHR's policy was already focussed toward small-scale and diversified farming. One participant stated that that such statements were "lip-service".

Table 31. KFC Farmer Statements About Proposal Five That UHMCTAHR and Farm Organizations Increase Publicity About Perceived Problems

<u>Organizationally Desirable</u>

1) If KFC could use its bulletin, it would be good.

<u>Culturally Desirable</u>

1) They (UH) <u>have</u> (has) <u>to</u> contact farmers.
2) Some people don't think there's problems.
3) There's a feeling that farmers don't care about what affects the world.
4) It should be on the local level.

<u>Technically Feasible</u>

1) Many farmers are not full time farmers.
2) It's a good suggestion to increase publicity.
3) They could try.

<u>Economically Feasible</u>

1) Don't spend too much money on things not utilized.

Table 32. TT Group Statements About Proposal Five That UHMCTAHR and Farm Organizations Increase Publicity About Perceived Problems

Organizationally Desirable
1) A lot of people read the newspaper.
2) We need discussion groups to find answers.

Culturally Desirable
1) Oh, yes this is very important. Those professionals want to tell farmers they can't apply it (chemicals).
2) Publicity is very important. Once the information is out people can react.
3) More dialog is needed.
4) Due to lack of response and comprehension by readers it is culturally inappropriate.
5) Publicity can lead to panic, which we don't want.

Technically Feasible
1) Use a list of farmers for giving reports.
2) Newsletters could be better and more of them.

Economically Feasible
1) Have the Coffee Council do it. They collect fees and should be addressing this.

Table 33. KFC Farmer Statements About Proposal Six Regarding Whether UHMCTAHR Should Focus on New and Existing Diversified Crops for Small-scale Farmers

Organizationally Desirable

1) It sounds exciting because Kona farmers don't see a clear cut policy statement. There's a need for long-term commitment, an agricultural policy for development in Kona. A study is needed, politicize farmers and form a farm coalition which can unify; work as one body. There's commercial competition for lands.
2) How does information get through? Big companies will benefit. A criteria for all growers is needed. A big problem with university research is that it goes on and on and doesn't get back until it is finished.

Culturally Desirable

1) The UH should be serving small farmers. If UH won't work with them, they won't be in the future, which would be a great loss. What would happen to the tourist industry? It would have a serious affect because tourists like the unique farming community. UH should not be working with large farmers who have facilities.
2) It's good to give direction for small farmers.
3) More small farmer focus is needed.
4) It's good to work for everybody, not just the individual.
5) It should cover everybody.
6) Focus should be on numbers of farmers.
7) Big corporations are going to jam up small farmers.
8) Forget about big farmers. Work with small farmers, too.
9) A diversified, small farm focus is good.
10) Diversified agriculture is a positive step. The main focus should be on improving the crops farmers already have.
11) Something else is needed besides coffee and mac nuts (e.g. guava, cacao).

Technically Feasible

1) One can see the acreage point because it is more effective for large farms. Working with small farmers is difficult.

Economically Feasible

1) Small farmers pay taxes too.
2) Small farmers add up.
3) The sugar lands (companies) can do their own research.

Table 34. TT Group Statements About Proposal Six Regarding Whether UHMCTAHR Should Focus on New and Existing Diversified Crops for Small-scale Farmers

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Organizationally Desirable

1) A balanced approach is needed. The issue is the modis-operandi. There are big farms with techniques (information) and five acre hilly, junk lands with 400 people. Where's the UH information (for them)? No one is telling.
2) UH brings in new things but information is not published. There is no favoritism between big or small farmers.
3) There is a need for more than one program.
4) Working just for small farmers is not good. A marketing study for diversified agriculture is needed. Intercropping studies are good ideas.
5) It should be recognized that numbers of farmers, number of acres and gross value are all important.
6) There is potential value for the state economy, crop improvement, and for information transfer if UH works with both groups.
7) A multiple level program is needed, which would include: 1) identifying potential crops, 2) getting financing for farmers, 3) providing plant materials, 4) having programs for farmers to follow (training and/or manuals), 5) provide technology transfer to other farmers, and 6) provide marketing assistance for small farmers.

Culturally Desirable

1) It is necessary to preserve the lifestyle of a small farm community.
2) The concept of diversified agriculture is good. UH is doing it.

Technically Feasible

1) There's no way Kona is (suitable) for plantations (sugar cane production). The climate is good for tropical crops. Agricultural farm land value is so high. A land classification is needed to put a ceiling on the price of land.
2) There are a lot of crops that haven't been looked at. Focus should be on diversified crops, both old and new and not just on small farmers.
3) This is a continued program for Hawaii and UH has a policy statement. The college should be better in publicizing and promoting itself.
4) Diversified agriculture is surface talk. That's about the size of it.
5) UH is basically doing nothing with sugar and pineapples. There's a new products center at UH.
6) A policy for diversified agriculture and small farmers is a good item but it's hard to keep plantation guys separate because they are more public.

Table 34. (Continued) TT Group Statements About Proposal Six Regarding Whether UHMCTAHR Should Focus on New and Existing Diversified Crops for Small-scale Farmers

Economically Feasible

1) Funds should go to do a diversified analysis (e.g. a computerized program).
2) The UH president can go to the legislature for a mandate to expand target programs. Implementation then is back at the legislature to get funds.
3) The amount of sugarcane and pineapple outweighs other crops.

7. Proposal Seven

Participant comments pertaining to involving UHMCTAHR agricultural engineers and retail sector in developing information and technology are presented in Tables 35 and 36. Seventy-four percent of the KFC farmers verbally favored the idea, however, two questioned retailers' motivations as being honorable. UHMCTAHR staff within the TT group stated that UHMCTAHR was already involved with these activities. Six percent of the KFC farmers and 5% of the TT group stated that they favored private business involvement.

8. Proposal Eight

Tables 37 and 38 present participant statements that addressed the proposal that UHMCTAHR and farmers undertake and follow up more on-farm research. The analyst discussed on-farm research with participants when discussing Proposal One. Seventy-seven percent of the KFC farmers verbally favored the proposal, however, 10% requested more information about the cost effectiveness of on-site research. Seventy-one percent of the TT group favored this proposal, however, 11% stated that on-farm trials would be difficult to manage due to varied levels of farmer responsibility and interest.

9. Proposal Nine

Tables 39 and 40 present participant statements about the proposal that UHMCTAHR and farm organizations upgrade and plan more educational activities. The analyst noted that KFC farmer comments varied as to participant impressions of which activities would be most effective. She noted that the TT group tended to favor increasing the extension service arm of UHMCTAHR activities in Kona. Ten percent of the

Table 35. KFC Farmer Statements About Proposal Seven to Involve UHMCTAHR Agricultural Engineers and the Retail Sector in Information and Technology Development

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Organizationally Desirable

1) UH Must be working hand-in-hand with retailers.
2) The more people, the better.
3) There is a need for someone on-site to give engineering help (e.g. irrigation).

Culturally Desirable

1) Then farmers can get new things that they want.

Technically Feasible

1) Involving engineers with farmers is good.
2) Involving retailers would be good if part of a committee. There has to be caution because they are thinking about making profit for themselves. Commissions would mean performing a community service function.
3) Are you out of your mind! Retailers are tight-lipped. Competition develops business. If you got a problem, talk to the growers.

Economically Feasible

1) It will be costly for farmers (e.g. irrigation).
2) There's too much spending in the government. Involve the private sector.

Table 36. TT Group Statements About Proposal Seven to Involve UHMCTAHR Agricultural Engineers and the Retail Sector in Information and Technology Development

Organizationally Desirable

1) UH Agricultural Engineering and Agricultural Economics departments should be involved. They're just out there somewhere right now.
2) The Agricultural Engineering Department has assisted with macadamia nut research.
3) Involving the Agricultural Engineering Department would be no problem, as long as there was no endorsement of a product.
4) For what product? Agricultural engineers are already working with growers directly with the coffee harvesters.
5) The retail sector only should be involved, because UH can't work fast enough.
6) Extension should utilize retailers more.
7) Maybe an extension specialist in agricultural engineering would be good.

Culturally Desirable

1) Retailers would be more than happy.
2) Small farmers have other needs, such as modifying equipment. Farmers can't do information searches.

Technically Feasible

1) One should see what private industry can provide.
2) Involving the private sector may limit the scope of projects. UH can't test a full range of products. Benefits are that they would listen to people's needs.
3) Retailers like to do these things, but may lack objectivity.
4) If you bring in retailers, they have to share information.

Economically Feasible

1) Referrals to private sector would not be needed if we had an assistant extension agent. Everybody is a taxpayer.
2) Funding might be able to involve the Agricultural Engineering Department.
3) It seems very economically feasible.

Table 37. KFC Farmer Statements About Proposal Eight That UHMCTAHR and Farmers Undertake More On-farm Research

<u>Organizationally Desirable</u>
1) On-farm, joint projects with collaborators (farmers, researchers, and retailers are needed.

<u>Culturally Desirable</u>
1) That's where it (research) should be done - on farms.
2) It's good to get farmers involved.
3) That's what they did before. Don't know what happened.

<u>Technically Feasible</u>
1) On-farm is essential with Kona's microclimates.
2) One can't wait for years for results, but it sounds good.
3) It doesn't give too much help (to farmers) if the scientist is on the experiment station, not in the field.

<u>Economically Feasible</u>
1) The problem is the cost of maintaining a technician when UH is trying to cut its budget. It goes in cycles.
2) Is it cost effective?

Table 38. TT Group Statements About Proposal Eight That UHMCTAHR and Farmers Undertake More On-farm Research

<u>Organizationally Desirable</u>

1) UH owns plots on experiment stations. It's hard to get them (UHMCTAHR) to volunteer information (forms, records). It would be different if farmers take measurements.
2) It's the function of the industry to get to individual growers.
3) To involve people means a synergistic benefit.

<u>Culturally Desirable</u>

1) It will make farmers feel important.
2) Farmers won't listen to UH staff sometimes. UH should find a "legitimizer" in the community, do tests on-farm and have him show everybody.

<u>Technically Feasible</u>

1) A lot of times the experiment station is one place and not in Kona.
2) Drs. "X" and "Y" visited farmers and asked about problems. They put test plots on farms to find data on each section of Kona.
3) Look at California. The University did research on-farm and private individuals followed up. It made the knowledge available.
4) It's a terrific idea if it works. Much depends on the collaborator. If the farmer doesn't understand or is not fully committed, then it's bad.
5) There are too many ways on-farm research gets screwed up.
6) If UH publishes data, for example on irrigation, farmers will get and need hands-on information.
7) This will find out where information will end up and make it accessible.

<u>Economically Feasible</u>

1) On-farm research is the quickest way to get farmers in position to help themselves and is time and cost effective.

Table 39. KFC Farmer Statements About Proposal Nine That UHMCTAHR and Farm Organizations Upgrade and Plan More Educational Activities

Organizationally Desirable
1) The disengaged should get involved, including the high school.
2) We need two (extension) agents.

Culturally Desirable
1) It's hard to relate to research pamphlets.
2) I'd rather see people go the field and do something practical.
3) Kona has to have education. Farmers have been farming for fifty years (the same way) and one can tell.

Technically Feasible
1) Brochures on anything new would be good.
2) Video is a good media.
3) Open houses are good.
4) One workshop had a big turn out.
5) Classes would be excellent.
6) There's no need for classes, but it's good to get the answers out.
7) There's a lot more authoritative information literature available. UH is in no position to provide advice. It's much too theoretical, away from agriculture.

Economically Feasible
1) It's good if farmers can get new things free.

Table 40. TT Group Statements About Proposal Nine That UHMCTAHR and Farm Organizations Upgrade and Plan More Educational Activities

Organizationally Desirable

1) The Extension Service needs more assistance to answer phone calls.
2) Classes are a function of extension.
3) A junior extension agent is needed to work with the agent. Hire them at the entry level of a basic (B.S. level) degree.
4) Real support should be given to the UH publications office.

Culturally Desirable

1) The current UH program is to put fires out.

Technically Feasible

1) Courses would be terrific and would hit some of the home owners, too.
2) One can do research in subjects while in classes.
3) One will never see college level courses because there's too high of expectations and too many prerequisites. Credit courses are out, extension type programs are good.
4) There's a need to consider if the classes would be credit or non-credit.
5) People may not need education if they turn their farms over to experts.

Economically Feasible

1) Kona doesn't have many people geared to classes. It won't be justified for such a low priority.
2) Classes would be good, but most farmers need pamphlets which would help everybody. The cost/benefit is good.
3) Some of the proposal's suggestions are a waste of time and money (brochures and videos), however, others are practical (demos, on-farm research, open houses).

participants questioned if there were enough students to warrant offering university-level classes in Kona.

10. Proposal Ten

Tables 41 and 42 present participant statements concerning the proposal that the extension agent should keep a log of concerns, undertake small group activities and involve the retail sector. Seventy-seven percent of the KFC farmer participants stated that something should be done to help the extension agent meet the area's growing needs, rather than continue the status quo. Fifty percent of the TT group spoke in favor of the proposal. Five percent questioned if the extension agent could focus his work to small groups, given the demands of individual growers.

11. Proposal Eleven

Tables 43 and 44 present participant statements about the proposal that suggested that UHMCTAHR begin to publish a research highlight every six months. Even though KFC farmers and TT group participants made comments pertaining to the cost of producing a news highlight, sixty-six percent of the KFC farmers verbally favored UHMCTAHR increasing its information to farmers. Eleven percent of the TT group did not verbally favor the proposal due to the cost of publishing and distributing a news highlight.

B. Follow-up Activities

After completing Stage Six formal debate activities, the analyst sent Stage Four subsystem activities (Figure 29) and Stage Five and Six charts (Figure 31) to two UHMCTAHR participants who were interviewed at the onset of Stage Six. Their comments were elicited by the analyst

Table 41. KFC Farmer Statements About Proposal Ten That the Extension Agent Should Keep a Log Of Concerns, Undertake Small Group Activities and Involve the Retail Sector

Organizationally Desirable

1) Kona needs more than one crop extension agent; one at the office that would rotate with one in the field.
2) The extension agent has tried to respond, but he's almost burnt out. It's hard for him to focus with so much.
3) UH won't allow for visits on-farm by the extension agent too often.
4) In other places with extension shortages, people (extension agents) do phone duty more.
5) It's a good idea to do group activities instead of visiting ten houses - more convenient.

Culturally Desirable

1) It's good to get the disengaged involved.
2) One former extension agent did it that way. Now it's not very practical.

Technically Feasible

1) One workshop had a big turnout.
2) A lot of farmers don't want to see the bad ones (practices).

Economically Feasible

1) With cutbacks, the University can't meet individual farmers needs.

Table 42. TT Group Statements About Proposal Ten That the Extension Agent Should Keep a Log Of Concerns, Undertake Small Group Activities and Involve the Retail Sector

Organizationally Desirable

1) Bulletins should be placed at retail outlets.

2) Engineers and neighbors could come to one problem (for example, replanting) and see the trees together.

Culturally Desirable

There were no comments concerning cultural desirability.

Technically Feasible

1) The extension agent should keep a log so he knows what he's doing.

2) If research were being done, it would go out.

Economically Feasible

1) Having the extension agent keep a log is definitely essential to locate things that can work in group sessions. It's a better use of his time.

Table 43. KFC Statements About Proposal Eleven That UHMCTAHR Begin to Publish a Research Highlight Every Six Months

<u>Organizational Desirability</u>

1) Farmers don't know what UH is doing.

<u>Cultural Desirability</u>

1) It would be good if it were in different languages.
2) It should not be in fancy talk.
3) It would keep interest up.
4) It would help people start thinking about doing something.

<u>Technical Feasibility</u>

1) Anything is good to keep farmers up-to-date.

<u>Economic Feasibility</u>

1) It would be costly but good.
2) It costs too much but reports are good.

Table 44. TT Group Statements About Proposal Eleven That UHMCTAHR Begin to Publish a Research Highlight Every Six Months

Organizationally Desirable

1) UH had Hawaii Farm Science, which was a first class publication. It was better than brochures.
2) Hawaii Farm Science was discontinued. The extension agent has a garden/agricultural column with readers that are non-agricultural tax payers.
3) It would be for UH's own benefit to show they are doing something.
4) Wonderful - what's going on in a nutshell.

Culturally Desirable

1) Progress reports are available but not in lay language. If need be, the researcher can write (a non-technical highlight).
2) UH recently hired staff (publicity) for better image.

Technically Feasible

1) It should also include the Crop Analysis (IAP).
2) It should include pesticide status.
3) Once a year UH scientists report at various commodity association meetings.

Economically Feasible

1) It would be too expensive. Farmers have to get answers when they ask.
2) The taxpayer should know what's going on. Then they would feel better toward the University. Now they think nothing is going on.
3) It may not be cost effective.
4) A newsletter/open house ever six months would be good. So would be toll free numbers for farmers to call on Oahu and a budget available for a community advisory panel to help plan UH's short and long term planned activities.

because 1) new information and proposals had been added during the debate process and 2) after the debate she realized that the system activities and proposals tended to favor Kona's perspective. The analyst incorporated their comments in the recorded debate tables presented above.

C. Summary of Stages Five and Six

During Stage Five, participants compared activities envisioned in Stage Four's improvement models with the current situation by 1) determining if and how the activities existed and 2) how their performances were measured. During Stage Six, participants suggested and debated proposals for change.

Stage Seven - Implementing Feasible and Desirable Changes

During Stage Seven, a subgroup of Kona participants, the Committee for Agricultural Research and Education (CARE) for Kona, developed a strategic plan. It included a statement of proposed future critical functions needed for actualizing improvements that were determined to be feasible and desirable during Stage Six's debate. CARE also determined who would carry out the activities, how the performance of improvements would be measured; including a means of identifying if and when action would be completed, and what resources would be needed. CARE decided that it needed to identify and form a larger committee consisting of all leaders of commodity organizations and other agricultural related community organizations that could marshal full community support for needed improvements. The extension agent attended the larger committee's meeting providing his input both as a UHMCTAHR staff member and a community resident. The analyst continued recording outcomes of the committee's discussions. CARE for Kona subsequently sent a letter (signed by six community organization leaders) outlining possible improvements to the dean of UHMCTAHR and invited him to visit Kona to discuss their concerns. The analyst noted that the tone of the letter was straight forward and cooperative. CARE members stated that they wished to foster a spirit of mutual understanding in order to improve problem situations. Two bills were introduced in the 1989 session of the Hawaii State Legislature to provide funding for addressing concerns identified during Stage Two of this study.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Soft systems methodology is an inquiry approach that evolved for dealing with situations in which human perceptions, behaviors, or actions are dominating factors and where goals, objectives and even the interpretation of results are all problematic (Naughton, 1977). According to Checkland (1981) "There will . . . never be a single (testable) account of a human activity system, only a set of possible accounts _all_ _valid_ according to particular Weltanschauungen" (worldviews). Concerns arising within complex human activity systems are often poorly defined and difficult to improve.

A number of different agrotechnology transfer procedures have been developed and tried, however, after some years they were found to be wanting or had deficiencies in one or more of their underlying premises. The Industry Analysis Program (IAP) has been the means by which agrotechnology and information are transferred in Hawaii since the 1970's. Although not the main thrust of the study, the analyst had the opportunity for comparing soft systems methodology with the IAP. Making this comparison revealed IAP shortcomings.

Soft systems methodology as applied to the tree crop farming concerns in Kona has resulted in change since the onset of the study. The analyst became a catalyst in the Kona tree crop farming community which is now helping itself. The UHMCTAHR administration has met with farmers and noted their needs. There has been legislative action for providing additional UHMCTAHR manpower in Kona. Soft systems, however, is a new methodology and may turn out to have drawbacks because finding improvements which satisfy multiple worldviews is difficult. Future soft system methodology applications are needed for identifying possible improvements to its process and techniques and for modifying it to meet specific requirements dictated by each situation to which it is applied.

Discussion About the Methodology

Chapter One introduced a study that applied soft systems methodology as a means for improving the agrotechnology transfer process responding to tree crop farming concerns in Kona. Chapter Two reviewed literature covering the background and premises of soft systems methodology. Chapter Three explained materials and methods used by the analyst during a ten-month study in Kona. Chapter Four presented the results of the seven stage process, involving sixty-eight participants, which lasted from April 1987 through January 1988.

Soft system's seven stages are as follows: Stages One and Two are intended to make sense out of a situation. Stage One begins an open-minded inquiry, gathering information from written sources and from people involved to see what makes the situation problematic. Stage Two produces a description which includes an identification of situation's structures, processes, climate and major themes of concern by worldview. Stage Three begins the application of systems thinking for gaining insight into what an improved situation might be. During Stage Three, all parties to the problem, transformations (improved functions), and environmental features which may or may not operate in the future are specified. A key part of Stage Three is the identification of tentative improved systems based on multiple worldviews of people involved in the problematic situation. Stage Four continues Stage Three's application of formal systems concepts by developing human activity systems models. During Stage Five, newly developed models of improved states are compared with the original, real-world situation as described during Stage Two. Stage Six involves debate about the desirability and feasibility of proposals for changes that emerged from earlier stages of inquiry. Do the proposals actually address issues of real concern? Are they feasible and desirable given established structures and processes of the situation? Can people agree on them as improvements? Stage Seven is the actual implementation of agreed-upon changes aimed at improving the situation. Stage Seven is not a final solution as the situation continually changes. These stages should be considered as part of an iterative process which leads toward improvement.

A. A Systems Approach

This soft systems research 1) was holistic, 2) was non-repeatable (in the statistical sense), and 3) involved several worldviews that affected the situation. Soft systems methodology was developed for improving concerns in closed, business situations where all actors were known and the problematic situation was easily defined. In contrast, Kona farmers and, more specifically, tree crop farmers involved with coffee, macadamia nuts and avocados presented an open-ended situation where all actors influencing the situation were not known and where some either were not willing or not available to be a part of the inquiry process.

Kona farmers interact with many different actors (political, social and economic) including state agencies (Hawaii County has similar counterparts) such as the Departments of Agriculture, Transportation, Business and Economic Development, the University of Hawaii, and etc. State and county policies (laws, rules, and regulations) provide an intricate and complex set of "Rules of the Game" affecting farm productivity, much of which isn't well-understood. In addition, federal agencies have their own "Rules of the Game" which may conflict with, or support state and local "Rules of the Game". In addition to political players, there are others in the community who provide support services to farmers and who also set their "Rules of the Game". Members of the farming community interact with and have considerable influence with politicians at the county, state and federal level.

The analyst interviewed many members of both the agrotechnology transfer process and the coffee industry for a holistic research focus. Some people important in the process, however, were not identified until the study was well underway. The analyst attempted to include key UHMCTAHR and KFC administrators in the study, however, their participation was never major. Reiteration of Stages Two through

Seven is needed to include these key actors and owners in the soft system process. Accounting for their worldviews is essential for improving agrotechnology transfer because their decisions will ultimately affect if and how the study's outcomes are implemented.

The analyst began the research by recording all concerns mentioned by participants. After Stage Three, she limited the scope of future activities because it was impossible to develop models for all participant concerns. The analyst focussed the scope of the study by counting the number of times concerns were mentioned as relevant and in need of improvement. Four concerns mentioned most frequently were addressed using information collected during Stage Three's CATWOE exercise. Two concerns were modeled jointly as one improved human activity system, another concern was modeled separately and the final concern was channelled for the technology development approach. Procedures describing when and how this focussing is undertaken are not well-articulated in current literature. Soft system methodologists and practitioners should develop guidelines for these decisions because subsequent soft system activities rely on them.

B. Public and Private Knowledge

Both public and private knowledge were important to the agrotechnology transfer process. Public, testable knowledge was obtained by reviewing literature pertaining to and observing Kona's biological and physical phenomena. UHMCTAHR researchers, using reductionist inquiry processes examined quantifiable factors by undertaking replicated experiments to refute hypotheses. Agricultural technologies were developed based on "facts" identified by reductionist inquiry processes. During Stage Four of the methodology, the analyst, based on agronomic and soil science training, suggested applying various inquiry approaches for tackling some of the farming concerns identified during Stage Two's interviews. Participants requested on-site assistance for better managing Kona's agroecosystems (Proposal One).

Private, 'non-testable' knowledge was important to the agrotechnology transfer process responding to Kona's tree crop farming concerns. Farmers made choices based on their perceptions about "what technologies and information are better than others". During Stage Two's interviews, four participant worldviews were identified that affected the tree crop farming situation in Kona. During Stages Three and Four, two participant subgroups used systems-based thinking techniques for designing their vision of improved purposeful, human activity systems. During Stage Four, participant subgroups designed models of conceptual systems that were hierarchical (composed of subsystems) and which existed in wider systems. They envisioned transformation of inputs to outputs, and designed improved states that functioned via communication and control mechanisms. Participants designed models that addressed concerns related to 1) farming assistance and 2) quality and marketing of Kona coffee.

During Stage Five's comparison of the models and the real situation, many participants said that the current agrotechnology transfer structure (the IAP) that identified and took action on commodity specific tree crop bottlenecks needed improvement for comprehending farmers' problem situations in Kona. UHMCTAHR uses the

IAP process to guide state policy makers in determining how funding should be allocated on a state-wide basis for state-wide priorities. Such allocation may or may not support the needs of a local community.

One IAP drawback is that priorities are set by industry members who rank bottlenecks by voting at town meetings. In Kona, most farmers are hesitant to attend meetings and share private knowledge. If meetings are held in Hilo, the county seat ninety miles away, or on another island, very few people attend. Consequently priorities are set by a few and, therefore, may not meet the needs of an entire industry. Soft systems methodology provided a means of reaching both farmers who attended meetings as well as those who didn't. Using this methodology for farmer input would make the IAP much more attuned to all the actors and not just a few.

IAP's did not address cross-commodity concerns which are important to Kona farmers using multiple and intercropping systems. Farmers also stated that IAP's could not be updated quickly enough to meet their needs. Ninety-four percent of the KFC farmers and sixty-six percent of the TT group participating in Stage Six stated that soft systems research was desirable for improving the agrotechnology transfer process and proposed adding soft systems methodology to the IAP process (Proposal Two). Since the study terminated, the problem situation has changed (e.g. legislative action and UHMCTAHR administration-community dialogue have occurred), making a reiteration of the methodology necessary. Further evaluation of the affects of this study's research is needed.

C. Evaluating Soft Systems Methodology

1. The Meaning of "Improvement"

Checkland (1981) proposed that soft systems methodology could be evaluated by measuring the degree of satisfaction or sense of improvement experienced by people engaged in problem situations. The word "improvement" implies subjectivity based on worldview; "improvement for whom, when and how?" The analyst was able to make a fairly accurate identification of concerns and potential improvements from those she interviewed. She was unable to obtain such information from a number of other players important to the agrotechnology transfer process who were not part of the study. Soft systems methodology pointed out unrest in the Kona tree crop farming community and discontent with the agrotechnology transfer process as it existed with regards to coffee, macadamia nuts and avocados.

Proposals One and Two were not viewed as "improvements" by some participants located outside of Kona because these proposals envisioned changes in state agency structures and processes. They included changes in staff deployment, roles, responsibilities, rewards, and qualifications. Ninety-five percent of the KFC farmers and sixty-eight percent of the TT group participating in Stage Six verbally favored having on-farm activities in Kona (Proposals One and Eight).

2. Outputs of the Methodology

The analyst was unable to control factors that affected the non-repeatable situation which occurred in Kona during 1987-88. The study, however, produced standard soft system outputs: a rich picture with identified and classified themes of concern, statements of improved situations, improvement models, debate on feasible and desirable changes, and a strategic plan.

3. Application to a Multiinstitutional/multilocational Situation

Checkland (1981) and other soft system methodologists applied the methodology primarily for improving uni-institutional settings. Examples of past soft system work involve private business firms defining their mission and designing models of improved states. Analysts were often hired by company management and their work was completed after Stage Six. The analyst found no examples in the literature using the methodology for a regional study.

4. Including the System's Users

None of the business-oriented soft systems studies reviewed by the analyst included consumer worldviews. Rich pictures were described based on interviews with business or organization management and employees and by examining company records. Problem situations involved well-defined structures and easily identifiable roles.

At the onset of this study, the analyst considered agrotechnology transfer users (farmers) as part of the problem situation. During Stages Two, Three and Six of the methodology, she interviewed farmers as well as leaders of commodity organizations and UHMCTAHR staff undertaking tree crop agrotechnology transfer activities. Roles were not always clearly defined; some randomly sampled KFC farmers, were also agrotechnology transfer actors.

5. Application for Improving Agrotechnology Transfer

During Stage Two, the analyst identified participant concern about the agrotechnology transfer process responding to Kona's tree crop needs. She used soft system techniques for recording information about tree crop concerns and what could be improvements. She noted that participant perceptions of the future affected how they acted during the time of the study. Worldview differences made finding "optimum solutions" or "consensus" difficult. The likelihood that all parties involved could be completely satisfied was nil, however, the study initiated UHMCTAHR and Kona community discussion.

6. Researcher Style

Checkland (1981) proposed that methodologies should accommodate various researcher styles. The analyst used cross-cultural communication techniques for establishing rapport with participants of various ethnic groups. She changed her communication style to match that of her audience. She did not lead discussions, rather recorded information, and tried not to impose her worldview on the situation. She carefully maintained participant confidentiality and found that guidelines for sharing public and private information gathered by soft systems research lacking.

7. Researcher Role

The analyst went into the situation with backing from her committee and with support from individual members of the UHMCTAHR Cooperative Extension Service. She went to the Kona community unannounced and without their being notified. The positive response from the community when they discovered her intentions was significant. They stated that someone at last was willing to listen to their needs. The analyst became a catalyst in the community. They continued to look for her support after she had completed her study, even to the point when they became politically active. Outcomes are beyond what was envisioned when the study was first developed.

The analyst had difficulty in staying outside the problem situation when applying the soft systems methodology. She worked directly with participants for improving tree crop farming concerns. Although she had no official role in the community, her actions affected the agrotechnology transfer process which she was studying. The GRASP program was developed for clarifying the analyst's, her advisor's and extension agent's roles. The analyst questioned if graduate students should undertake studies affecting real-world problem situations involving institutions from which they will be awarded their degrees. Because of liability issues, she was unable to provide farmers technical advice about tree crop production.

The analyst felt that she owed the study's participants more than a written dissertation after Stage Six was completed and continued to support and work for them as they undertook Stage Seven. She found that it was difficult to not feel ownership of the study's results after being engaged with Kona's participants for ten months and having worked with a subgroup of participants in developing and implementing their strategic plan. She felt satisfaction from working with participants in tackling real-world problem situations.

She questioned if she will be able to fully disengage from her role as a soft systems analyst in Kona because participants continue telling her confidential information since the study terminated. She concluded that the methodology would best be used by UHMCTAHR staff and community leaders who are associated with problem situations over long periods of time, rather than outside researchers undertaking specific projects. Outside analysts might be needed in highly polarized situations with well-entrenched conflicting views of improvement. There is, however, not a body of literature that gives detailed accounting of this particular question.

The original research proposal envisaged that the extension agent's intervention would serve as a "control" to which the analyst's soft systems work would be compared. Shortly after beginning the research, the extension agent and analyst found that it was impossible to keep him from being involved. He was part of the problematic situation and affected human activity systems with which the analyst was working. His input was instrumental for improvement.

Discussion on Techniques Used During The Study

The analyst found that the journal she kept was a valuable means of recording information over time. She recommends that a summary of each soft systems stage should be drafted immediately upon its completion in order to make reporting less burdensome at the end of the study.

A. Stage One

In order to ascertain information that was as unbiased as possible, the analyst sampled at random from the area's largest farm organization's membership list. Because most KFC farmers raised coffee and macadamia nuts, the study addressed the agrotechnology transfer process responding to these tree crop concerns. The sampling procedure did not adequately identify children of older farmers because farm families are usually listed under their fathers' names. Few of these farmers were available for interviews because they worked off-farm during the day. A different interviewing procedure is needed for gathering information from these farmers. A master list of the region's farmers would be helpful for random sampling. The analyst concluded that although the random sample consisted of KFC farmers, it better represented Kona's tree crop farming community than the IAP process because it included information from farmers who did not attend meetings.

The analyst attended community meetings and used advice from the extension agent to identify TT group participants. They were included in the study because the state and UHMCTAHR recognized them as representing farmers in the agrotechnology transfer process. The analyst found that TT group farmers' views of improvement were similar to those of the randomly selected farmers, however, TT group farmers tended to have a more economical-oriented farming outlook. The analyst observed that UHMCTAHR research trials were with a few, highly visible "opinion leader", TT group farmers. How and to what extent TT group farmers affect agrotechnology transfer needs examination, given that a small percentage of the farm population participates in commodity organizations. TT group participants that lacked farming experience tended to be more technological and research oriented.

During Stage One, the analyst became familiar with Kona's geography with the help of the extension agent. He knew several of the randomly sampled farmers and suggested the order of the analyst's visits. The analyst concludes that these farmers were probably the type of farmer that sought help from UHMCTAHR and may have provided different information than those interviewed later. Because each round of interviews took the analyst up to two months to complete, return visits were generally scheduled according to the order of visitation set during the first interview. A rerandomization of participant visits is needed at the onset of each stage to minimize any bias in obtaining information caused by the order of visits.

During this stage, the analyst changed the focus of the study from addressing adoption of a specific agricultural technology because farmers did not perceive macadamia nut pest infestation levels as problematic. The study's focus could be broadened because soft system methodology uses an action research approach. This approach may be inappropriate for studies if a specific focus must be determined before undertaking research. In the case of this dissertation, the analyst's committee allowed amendment of research activities when needed. The analyst provided them with progress reports during the research.

B. Stage Two

The analyst spent over three months developing the situation's rich picture. She needed time to understand the situation and avoided moving into action too quickly. During this stage, she did not try to organize information into and identify "systems" because such analysis might have implied interconnectivities that did not exist.

The study's random sample group consisted of forty participants; 10% of KFC's total population. After reviewing notes from interviews, the analyst found that little new information was obtained after the thirtieth KFC participant interview. A point of diminishing returns had been reached. In future studies, the number of participants interviewed may vary, however, in order to save time, this point of diminishing returns should be kept in mind. If additional information is needed, Stage Two's interviews could be reiterated later.

1. Interviewing Technique and Response

The methodology assumes that people are concerned about problematic situations and will discuss them. This may not always be the case. Kona participants were most forthcoming with private information and rapport building was relatively easy. The analyst attributed her success at discussing concerns with participants to her ability to initiate conversation. She became a catalyst and influenced people's willingness to talk about their concerns. She questions if particular personality types or training are needed in order to be successful at interviewing. Perhaps would-be analysts should be screened and evaluated for their communication skills before beginning research.

The analyst carefully developed the wording of her first phone call to participants. She felt like a "used car salesman" selling herself to interested participants because positive first contact with them was essential for future activities. Response to her initial telephone call was much higher than that of mail surveys conducted previously in Kona (Howard Simon, Chairperson, Hawaii Avocado Association, personal communication, 1987).

The analyst found that state-wide agricultural data collection mechanisms provided inadequate information for analyzing the Kona tree crop situation because they did not 1) report between and within district variation and 2) account for the type of farming systems predominant in Kona (small-scale, mixed cropping with much off-farm employment). Reporting agencies that use derived statistics have low-end cut off points that define what constitutes a "farm", and, therefore, may exclude small farms which when combined have considerable production. This study was limited to participants who could be contacted via phone. Improved means of collecting district-wide, small-scale farming information and contacting participants without phones are needed.

The analyst found that 1) she had difficulty scheduling meetings outside of Kona and 2) interview time was too short when she visited Manoa and Hilo. This was the reverse of the problem of UHMCTAHR researchers who visited Kona. She visited Manoa at the onset of each soft system stage and discussed outcomes of the previous stage with her advisors. At that time she undertook the next stage's interviews with Manoa participants. She found that the amount and type of information she collected during each interview compounded and that Manoa participants should have been interviewed twice during each stage.

During the interview process, the analyst used mind-mapping as a means of recording her observations. Tape recorders were ruled out as being intrusive as well as requiring a lengthy transcription process. She found that mind-mapping was culturally acceptable in Kona. The practice of redrawing mind maps nightly helped review information that she had gathered during the day and assisted her in becoming aware of the situation's main themes of concern.

Information from TT group participants was reported aggregately except on composite mind maps. Within this group considerable variation in worldviews existed. Once all worldviews are sorted out then information gathered subsequently should be presented by specific worldviews.

The analyst dropped demographic production questions pertaining to off-farm employment because farmers were reluctant to give her answers. It was important to gather information that participants perceived as relevant in order to maintain their interest.

The analyst recorded participant ethnicity based on that of the primary decision maker. With interracial marriages, business firms and research teams, ethnicity was recorded for that person who verbally contributed the most during the first interview. In this study, information about participant ethnicity did not appear to affect the outcome of the research.

2. The Rich Picture

At the time of the study, the analyst did not consider that the rich picture sections needed to be written in a form specific for a PhD dissertation. Much of the original rich picture descriptions in her journal were not directly reportable herein. Sensitive environmental, political, economic and social issues voiced by individual participants if openly transmitted would not be constructive. Analysts, before writing, must consider for whom and for what function rich picturing will be reported.

a. Structures, Processes, and Climate

Descriptions of the situation's structure and processes were used for understanding the situation's climate. Climate reflected participant mismatches in worldviews about the situation and potential agrotechnology transfer improvements. Relationships among a close knit agricultural community were recorded in the climate section. Some Kona participants stated that UHMCTAHR participants from outside Kona neither understood the importance of these relationships nor accounted for them in the agrotechnology transfer process.

The analyst found that writing separate structures, processes and climate sections was difficult because they were interrelated. Multiple activities occurred within hierachally nested structures and processes. Writing separate sections of the rich picture reduced the capacity for viewing the situation holistically and identifying interconnectivities. The analyst suggests organizing the document by worldview or by themes of concern.

b. Themes of Concern

(1) A Two-step Process

Before identifying specific themes of concern and drawing composite mind maps, the analyst organized information on cartoon-like drawings. She identified that some concerns were at a non-commodity specific level and that other concerns pertained only to single commodities.

(2) Visual Presentation

The analyst used composite mind maps that she had developed during Stage Two for initiating Stage Three's activities. Criteria are needed for placing concerns on composite mind maps. In this study, concerns appeared as legs on some mind maps and tails on others. Attention should be given to word size, lettering and arrangement because mind maps are communication tools for sharing information among participants. They were helpful to participants because they visually presented each theme of concern by worldview.

(3) Issue-based Themes of Concern

The IAP did not address all issue-based concerns identified by the analyst because it can only respond to those voiced at commodity-specific public meetings. Soft systems identified a number of important concerns that were beyond the control of participants and analyst to address at the time that this study was undertaken. Some of these concerns included: availability of agricultural land and water, pesticide usage, competition for labor, marketing and quality controls, competition from other regions in the state growing similar commodities, and competition from overseas that may or may not have the same quality but that compete for the same market.

The analyst was reluctant to address some issue-based concerns because 1) she was a graduate student attending UHMCTAHR and 2) structural changes implied by issue-based concerns usually are more difficult to tackle. This study addressed concerns that were discussed most frequently by participants, regardless of whether they were classified as issue-based or primary-task oriented.

(4) Comparing Themes of Concern With IAP Bottlenecks

The analyst found that it was difficult to compare IAP bottlenecks with this study's themes of concern. IAP's procedures generated action plans for specific solutions that had been identified to solve problems (a how orientation) rather than generating action plans for operationalizing envisioned improved situations as represented in models (a what orientation). During Stage Two, themes of concern were identified and courses for action were defined later during Stages Six and Seven.

C. Stage Three

The analyst's interviews provided a means of communicating information about commodity organization and UHMCTAHR activities to many farmers who stated that they did not know what these entities were doing.

Participants appeared to like developing relevant systems. If a concern was pressing enough for participants to mention, they had usually thought about improvements. The analyst requested information about desired situations and functions, not people or organizations perceived to cause problems.

Participants were able to identify key actors (people, organizations, and institutions) who would be important for undertaking activities occurring in improved states. Disengaged KFC farmers often stated that they did not know who might be able to help or hinder improvement of the situation (situation owners) or, perhaps, did not wish to share this information. They had difficulty in identifying environmental constraints possibly because they lacked an understanding of other systems affecting Kona.

At the end of the CATWOE exercise, the analyst asked participants why they felt improvements were needed in order to ascertain their worldviews. She found it essential to record this information in their own words, rather than relying on her impressions. It also was a good means of summing up the conversation.

The analyst found that she affected the situation by recording concerns and facilitating discussion with KFC and TT group farmer participants about possible improved states. She reported to UHMCTAHR participants and administrators that farmers perceived coffee ant and scale problems as threatening the coffee industry, however, UHMCTAHR response was minimal. Her research caused commodity organizations to request that UHMCTAHR improve its response to tree crop farming concerns in Kona.

If time and resources had allowed, a recycling back through Stage Three was needed to give all participants a chance at developing CATWOE components for the most frequently mentioned relevant systems. This information would have provided more information for formulating conceptual models during Stage Four.

D. Stage Four

Arranging meetings for two or more subgroup participants that designed models was difficult due to their busy schedules. One meeting that did take place at the onset of Stage Four, began with confusion because participants lacked experience with human activity system models. Practice model components that the analyst had previously prepared assisted these participants in understanding how to contribute to model design. Other systems analysts might find this practice helpful for instructing soft system participants. (See pp. 130–131 for a description of procedures used).

E. Stages Five and Six

The analyst found that many farmers did not know current mechanisms by which activities were undertaken. The analyst did not record participants' responses when they compared real-world and model activities during Stage Five and recommends that techniques for recording Stage Five results should be developed in future soft system applications. Debate recorded by the analyst addressed Stage Six's proposals. She recorded participant verbal responses and lacked a procedure for recording visual responses. The analyst found that cultural changes proposing the least societal friction were favored most by participants.

Comments on the Farming Assistance Model

A subgroup of participants primarily from Kona developed a model responding to farming assistance concerns because most UHMCTAHR participants were either unavailable or uninterested during the time of Stage Four. The model, therefore, reflected a worldview prevalent in Kona that the level and kind of UHMCTAHR assistance did not adequately address Kona's tree crop farming needs. Most Kona participants favored decentralized research activities located in Kona while most participants from outside Kona had a different worldview favoring Manoa and Hilo-based services.

Although outputs from Stages Four and Five appeared reasonable from the perspective of most Kona participants, from other viewpoints these may not have been valid. One TT group participant suggested that farmers should contribute to the process that comprehends Kona's needs by attending IAP meetings and by communicating with the extension service and commodity organizations. He stated that a new actor, an additional extension agent, was needed to serve Kona's needs instead of endorsing this study's proposals for change. One KFC farmer questioned the cost effectiveness of the soft systems approach. Three TT group UHMCTAHR staff stated that adding soft systems methodology as a process operating within UHMCTAHR's structure is too costly because it requires one-on-one interviews. For UHMCTAHR which has limited manpower and resources, it would be impossible to visit every farmer and address every site specific situation. Although the analyst primarily used one-on-one interviews for obtaining information, alternative techniques could be applied for collecting group information. For example, participants suggested that the extension agent should keep a log of concerns that he receives by phone and arrange group meetings for neighboring farmers (Proposal Ten).

No one within UHMCTAHR is obliged to participate in IAP's and consequently members who are responsible for operating the program are limited. The priority setting process also limits participation by UHMCTAHR faculty in that if the funded priorities do not match interests and/or disciplines of the faculty, they receive no support from the program. Outputs from this study show that fine-tuning of IAP with input from strategically conducted interviews, including a sample of all farmers (those who attend meetings as well as those who don't), could improve the agrotechnology transfer process.

Kona participants specifically requested agrotechnology transfer activities that assisted small-scale farmers (See Proposal Six). Some stated that UHMCTAHR agrotechnology transfer activities favored large-scale growers which might ultimately cause the downfall of small-scale farmers. The analyst suggests that a state-wide model is needed that would design human activity systems that enhance the viability and sustainability of different types of agricultural activities throughout Hawaii. Large-scale Hawaiian sugar and pineapple plantations employ thousands of farm workers and should be included in state-wide agrotechnology transfer planning. This study did not address concerns at a state level and could be expanded to include additional agricultural entities. Kona represents only one community in the state, which consists of a number of such communities, each unique in its own right and with differing needs and requiring different actions. This study did not address the problem of allocating scarce resources at a state-wide level. It was never intended to do so, yet this needs to be done.

The model developed in response to tree crop farming assistance concerns in Kona appeared similar to past research-extension models; the major difference, however, was who controlled, participated in and used the system. Technology transfer partnerships were envisioned in which control would be shared between the Kona community and UHMCTAHR. Farm organizations would have a major decision-making role in determining what activities should take place as well as how they would be implemented. Community members would assist in selecting UHMCTAHR staff located in Kona. Community organizations would pursue funding to undertake system activities.

The model illustrated key differences between holistic and reductionist approaches to dealing with the agrotechnology transfer process. Traditionally research, extension and farming tasks were assigned to specific actors: researchers designed and developed information and technologies, extension agents disseminated them and then farmers were expected to adopt them because they had been determined to be "significantly better" by researchers. The subgroup that modeled the "improved" system stated that UHMCTAHR expertise was essential in the agrotechnology transfer process. Most Kona participants felt that additional client-oriented approaches were needed to better comprehend and respond to concerns of Kona's farmers. One TT group participant stated "UHMCTAHR focuses on crops that happen to be raised by humans, but staff working in the field work with people that happen to raise crops."

Participants who developed the model stated that Kona's situation was dynamic; today's "status quo" would be tomorrow's problematic situation. Management of their real-world problem situation required constant updating. The analyst's academic schedule did not permit time for reiterations of the methodology. Kona participants requested that someone with soft systems training be assigned permanently in the community. The analyst concluded that some participants, especially leaders of commodity organizations, understood and wanted to learn the soft system methodology. Others, however, may not have fully understood the process but endorsed its usefulness as implemented by this analyst. Subsequent to this study a subset of participants developed a job description for a Kona-based diversified crops agriculturist with soft systems training.

Some participants stated that private businesses were more efficient than UHMCTAHR for developing and making technologies and information available. The analyst observed that, for the most part, retail farm equipment suppliers who were outside of the current, formal agrotechnology transfer process, however, were in direct contact with farmers. They are underutilized actors in the present situation's transfer structures and processes.

Other Problems Encountered

Interviews were often delayed or cancelled. Sometimes farmers were busy with harvest activities and interviews were delayed for several months. Some UHMCTAHR staff and farm organization leaders took the analyst's research lightly and were unavailable or uninterested after their first interview. Some were not accustomed to or felt it inappropriate to share information with graduate students. Participant travel delayed interviews. Analyst trips to Honolulu for Manoa interviews were limited due to time and resource constraints.

The analyst observed communication gaps among UHMCTAHR staff, commodity organization leaders, and the farming community. Some UHMCTAHR staff stated they they were frustrated because the current agrotechnology transfer system's bureaucratic structure could not improve its procedures for addressing farming concerns. The analyst noted that some TT group participants and UHMCTAHR administrators did not value extension and farming activities as much as research because it produced public knowledge.

Several major players, including some of the KFC Board of Directors and management as well as UHMCTAHR administration, were not available, hence outputs presented in Chapter IV reflect only the thinking of members of the Kona tree crop farming community and others in the agrotechnology process who were interviewed. All of the players were not available or willing to participate, therefore, outcomes from Stages Four through Six may not be feasible or desirable to those in ultimate control. What the outputs might have been had other players been actively involved in the process is somewhat speculative.

Soft systems analyses may have limitations in dealing with a large open-ended situation as in Kona. It was difficult for a single student analyst to pull together all information needed and to go through procedures in a reasonable length of time. If it is used as a tool for ongoing community development, then the time frame may not be so significant.

Funding severely limited agrotechnology transfer activities responding to tree crop farming concerns in Kona during 1987-88. Commodity organizations were extremely short of financial resources because of lack of farmer support. UHMCTAHR had experienced severe college-wide financial cutbacks. The analyst's research funding limited the length of time for and scope of research activities.

Because this was the first time soft systems methodology was applied in the field of agronomy and soil science at the doctoral level, the analyst encountered misconceptions about her research. Some farmers expected her to be an "expert" providing basic scientific information. Some UHMCTAHR staff found the research social science oriented and did not consider it relevant to agricultural production problems. Additional applications of soft system methodology for improving farming concerns will help establish its usefulness.

Future Application of Soft Systems Methodology for Tackling Real-World Problem Situations

Four methodologies were identified by the national curriculum reform effort as valuable for tackling problem situations. Soft system methodology is designed for improving situations involving humans with worldviews that affect activities designed for a purpose. This dissertation applied soft systems methodology in an attempt to improve the agrotechnology transfer process responding to tree crop farming concerns in Kona. An adequate assessment is not possible at this time of the extent to which this soft system application improved the agrotechnology transfer process, however, it has caused change to occur in a problematic situation. Instruction should be available to agricultural planners and practitioners, community members, and university students concerning when and how to apply each methodology correctly. Incentives for undertaking soft systems studies should be provided.

APPENDIX A

GRADUATE RESEARCH AGRICULTURAL SYSTEMS PRACTITIONER (GRASP) PROGRAM

During Stage One, the analyst, extension agent and UHM advisors developed a program that provided a structure in which the analyst could operate. It outlined the roles and responsibilities of the graduate student, a representative from a host agency (the extension agent, in this case) and a UHM faculty advisor.

Description

This program is a mechanism by which graduate students gain non-classroom education by joining a county extension office/private business and assisting in providing services to farmers/clients. Students incorporate systems thinking and practice previously learned in the classroom by undertaking a major research project. Beneficiaries of this program include farmers, extension agents, researchers, private businesses and students. It offers an alternative research approach for improving real-world problem situations and provides an avenue for development of applied research.

Objectives

The program provides: 1) systems expertise to public and private businesses, 2) hands-on experience, and 3) real-world applications for systems research.

Outcomes

The program provides on-site training for a) students, extension agent/business people, and UHM faculty members (hereafter referred to as "participants") exchanges of technical knowledge, b) utilization of systems-based approaches for inquiry into problematic situations faced by agricultural and natural resource managers, c) students to develop community networks that enhance management of extension agent/business efforts, and d) students to have farmer/client interaction under supervision. Extension/business staff have opportunities for a) exchanging technical knowledge, b) trying systems-based approaches on issues they tackle, c) developing additional data collection and management skills, and d) learning state-of-the-art ideas emerging from universities nationwide. UHM staff have opportunity for applying their academic training to real-life situations.

Specific Student Tasks

Students devote a minimum of half of their work time to thesis/dissertation activities, recognizing that other time spent in the office/business is also directly related to their research topic. They become part of a team working for improvement of food, agricultural, or natural resource situations by assisting the extension agent/business person. Students engage in daily "trouble shooting" activities such as answering client telephone requests, attending meetings, developing data bases, setting up on-farm trials or extending business services, serving as a liaison with university faculty, and performing various other routine office tasks on not more than a half time basis. They share research ideas, practices, results, personal observations and enthusiasm with other staff.

Specific Host Agency/Business Tasks

The host agency/business appoints at least one individual who works with a) students so that they are involved with tackling major themes of concern and daily tasks involved in operating agency/business and b) UHM faculty members. The agency provides students office space, facilities, encouragement and direction, including backstopping in situations that are too complex or delicate for students to handle on their own.

Specific UHM Faculty Advisor Tasks

At least one UHM faculty advisor 1) acts as a link to the UH campuses, 2) periodically works with host agency/business contacts and students, 3) serves as liaison to the student's UHM graduate committee, and 4) secures insurance and liability protection.

Compensation

Compensation is negotiated on a case-by-case basis and is dependent on activities undertaken and resources available. This does not preclude provision of cash or kind for services rendered to host agency/business or expenses incurred during the research process.

Student Qualifications and Experience

Students must have background in systems education; computer skills; grade point average (GPA) of 3.5+ in an agricultural/natural resource management related field; good communication skills; experience in multicultural settings; ability to project a pleasant personality; and a commitment for improving problematic situations, including a willingness to work long hours.

APPENDIX B

AN OVERVIEW OF THE SITUATION RELATED TO KONA'S AGRICULTURE

The analyst developed this document during Stage Two as part of the rich picture describing the situation related to Kona's agriculture during 1987-88. It is a synopsis of census data, historical and geographical literature, planning documents, and personal conversations.

The Physical Environment

The Big Island of Hawaii is twice the size of all other Hawaiian islands combined. Hawaii County encompasses all the Big Island's land area, amounting to 2,581,888 acres (1,045,665 ha). Four and a half government districts comprise West Hawaii County: all of North Kohala, South Kohala, North Kona, and South Kona and approximately half of Ka'u. North and South Kona districts (hereafter referred to collectively as "Kona") lie between 19^{o} and 20^{o} North latitude and 156^{o} West longitude on the central west coast of the Big Island. The four census tracts encompassing Kona have a land area of 530,000 acres (214,650 ha). (State of Hawaii, Department of Business and Economic Development, 1987a).

The Big Island was formed by lava flows from five large volcanos: Mauna Kea (13,796 ft/4205 m), Mauna Loa (13,679 ft/4169 m), Hualalai (8271 ft/2521 m) (State of Hawaii, Department of Business and Economic Development, 1987a), Kilauea (4090 ft/1247 m), and the Kohala Mountains (5480 ft/1670 m) (County of Hawaii, Department of Research and Development, 1980). Soils vary and are related to their date of formation with parent material being either pahoehoe (smooth and flat) or a'a (porous and chunky) lava. Many are young without distinct profiles. Many farms have little soil and crops are planted in broken lava stones. Soils are well drained and topography is moderately sloping (County of Hawaii, Department of Planning, 1982). Soils are high in organic matter and some are classified as Histosols. Soils range from light beige to dark brown in color. Andepts with low soil pH are common. Sorption of phosphorous tends to be low possibly due to high soil organic matter content blocking usual fixation sites (Dr. N. Hue, UHMCTAHR soil scientist, personal communication, 1987).

Kilauea volcano in East Hawaii has been erupting for five consecutive years. West Hawaii's last lava flow occurred in the 1950s in south Kona. Inhabitants mention smog caused by volcanic emissions (vog) as a possible cause for a change in the area's weather and lower crop production.

Kona's weather is more typically "tropical" than other areas in the state. Mauna Kea, Mauna Loa and Hualalai lie to the north and east of Kona, directly in the path of Hawaii's trade winds. Kona's weather, therefore, is far less dictated by these winds than other islands and influenced more by local convectional cells. Most precipitation occurs during the summer months; winters are cool and dry. During the summer, mornings are normally clear. As the day heats up, rain clouds form above the sea, move inland, condense and rain during the afternoon at approximately 3,000 feet (914 m) in elevation. Coastal areas receive less than 30 inches (762 mm) of rain. Seventy inches (1778 mm) is common at 1500 feet (457 m), 80-100 inches (2032-2540 mm) at 3000 feet (914 m), and 35 inches (889 mm) at 5000 (1523 m) (County of Hawaii, Kona District Rural Areas Development Executive Committee, 1962). Humidity ranges from nearly 0 to 90%, depending on time of day and elevation. Kona has received 60-65% of normal rainfall since 1982 (United States Department of Commerce, National Oceanic and Atmospheric Administration, 1987). Temperature is inversely related to elevation. It becomes cooler as one travels up the mountain slopes (County of Hawaii, Department of Research and Development, 1980). Temperatures reach 90^{o} F (32^{o} C) at sea level, however, they fall below 50^{o} F (10^{o} C) at 3000 feet (914 m). (UHM, Department of Geography, 1983).

The Population of Hawaii County

It is estimated that between 120,000-150,000 people lived on the Big Island of Hawaii when Captain Cook arrived in Hawaii in 1778 (County of Hawaii, Department of Research and Development, 1980). Most Hawaiians lived in the North and South Kona districts (County of Hawaii, Department of Planning, 1982). By 1872, however, the island's Hawaiian population had dropped to its lowest point (16,001) (County of Hawaii, Department of Research and Development, 1980).

During the 19th and 20th centuries, immigrants from Mainland U.S., Japan, China, Spain, the Philippines and elsewhere came to work on sugar cane plantations and cattle ranches and the island's population grew steadily. From 1930 to 1960, mechanization of the sugar industry created limited employment opportunities and emigration resulted (County of Hawaii, Department of Planning, 1987).

Since 1970, Hawaii County's population has rapidly increased. In 1986, it was the state's second most populous county with 111,800 inhabitants. (County of Hawaii, Department of Research and Development, 1980). Between 1970-86, the portion of Hawaii County residing in west Hawaii increased from 25% to 35%. In 1986, 39,300 inhabitants lived in west Hawaii county, with 68% of them residing in Kona. During 1970-80, North Kona experienced the highest recorded population growth in the state (184.5%). Rapid growth rates were reported in west Hawaii county during 1980-86: South Kohala (45%), North Kona (43%), Kau (25%), and South Kona (20%). (State of Hawaii, Department of Business and Economic Development, 1987b). The Hawaii County Plan (County of Hawaii, Department of Planning, 1987) estimated continued rapid expansion of West Hawaii county and the Puna district in East Hawaii. The 1980 U.S. Census of Population and Housing reported over 4700 families lived in Kona. Small family size was typical to Kona. The area's median age was 28 years and the average family income was approximately $22,810. Unemployment was 5% in 1980. (United States Department of Commerce, Bureau of Census, 1983b).

Hilo is the island's largest city with a population of over 35,000 people (State of Hawaii, Department of Business and Economic Development, 1987a). Kailua in Kona, the island's second largest city with over 4000 inhabitants (United States Department of Commerce, Bureau of Census, 1983a), serves West Hawaii as a retail, financial and professional hub (County of Hawaii, Department of Planning, 1982). Kailua is approximately two and a half hours drive from Hilo, a distance of 87 miles (140 km) (University of Hawaii, 1983). Kailua is 168 miles (270 km) from Honolulu; air travel time of 30-45 minutes.

Agricultural Production in Hawaii

In 1986, there were 4600 farms in the state that earned or had the potential to earn $1000 or more in sales of agricultural commodities. Fifty-five percent of these farms were located on the Big Island, representing approximately 60% of the total state acreage (State of Hawaii, Department of Business and Economic Development, 1987a) (1,957,501 acres/792,788 ha). Most farms were small, between 1-9 acres, and farm sales averaged below $5,000 per farm. Most land (348,491 acres/141,139 ha) in Hawaii County was owned and operated by individuals or families, however, 21 trusts, cooperatives, estates or institutions, owned 329,783 acres (133,562 ha). There were 786 tenant farmers in Hawaii County that farmed 210,320 acres (85,180 ha) in 1982. There were 1347 operators that listed farming as their principal occupation and 1192 listed another occupation as there principal occupation. Over eleven hundred farm operators reported 100 days or more of off-farm work, indicating several farmers were part-time farmers. There were 336 hired farm laborers that worked 150 days or more. (United States Department of Commerce, Bureau of Census, 1984).

The State of Hawaii and Hawaii County has experienced a movement away from sugar cane production to diversified agriculture. In 1976, 62% of the state's agricultural land was in sugar and 38% in other crops. By 1986, sugar amounted to 49% of the state's acreage and diversified agriculture had grown to 51%. On the Big Island, in 1976, 70% of the agricultural acreage was in sugar and 30% in other crops. By 1986, sugar had dropped to 45% and diversified agricultural crops had risen to 55% (State of Hawaii, Department of Business and Economic Development, 1987a) of the total agricultural production.

Six hundred-thirty macadamia farms on the Big Island (14,400 bearing acres/5,832 ha) raised 99% of the state's total crop, which amounted to over $35 million. During 1986-87, 2,000 acres (810 ha) of coffee were harvested from 620 farms in Kona and amounted to $8.7 million in sales. In 1986, 330 acres (1334 ha) of bearing avocados, mostly in Kona, added $333,000 to the state's agricultural sales. (State of Hawaii, Department of Agriculture, Hawaii Agricultural Statistics Service, 1986). Major diversified crops grown in Kona are: coffee, macadamia nuts, avocado, citrus, vegetables and ornamentals.

Tourism is the island's largest industry, however, there has also been an increase in agricultural related employment. Most manufacturing on the island is agricultural related. (County of Hawaii, Department of Planning, 1987).

Kona's Agricultural Base

Kona's agricultural land lies on the slopes of two large volcanos (Hualalai, the fourth largest volcano in Hawaii and Mauna Loa, the second largest volcano). There are over 1500-2000 farms in Kona (Norman Bezona, UHMCTAHR Hawaii County extension agent, personal communication, 1987). The prime agricultural land belt lies between 600 to 2000 feet (183 to 610 m) (Kona Coffee Council, 1987), an area characterized by lush vegetation and a mild climate. This belt is becoming rapidly urbanized because the charm of rural life is appealing to many people and it is a favorite retirement spot. Gentleman farmers and absentee landlords are growing in numbers.

Makai (seaward) of the agriculture belt, land is desert-like and supports kiawe (Prosopis spp.) and haole koa (Leucaena leucocephala). The State of Hawaii is attempting to utilize specific lower elevation areas by designating "agricultural parks" that are leased to encourage agricultural development. The Big Island has few beaches.

Farms in Kona's coffee belt are small, ranging from .25 to 40 acres (.1 to 15.75 hectares) in size. Some lands are fee simple and can be bought and sold freely. Other lands are held by a land trust for Hawaiian people established by orders stated in a Hawaiian princess' will and other large land owners descendent from early European and Mainland settlers. Leases are negotiated privately between landlords and farmers and have been held by farm families for three generations.

Kona's water supply system is "overcommitted" (County of Hawaii, Department of Planning, 1982). Although sources have not been specifically developed for agricultural water use (Virginia Isbell, Hawaii State Representative for Kona, personal communication, 1988), several farms have installed irrigation systems. Rainfall is caught in cisterns and plants are gravity fed. Another source of irrigation water is the county water supply which is accessible to farms located within a quarter mile (.65 km) from the main highway, Highway 11, which transverses the district from north to south. A typical coffee irrigation schedule is 1-2 gallons (3.79-7.57 liters) per plant two times a week depending on soil conditions, rainfall, plant age and other factors (Norman Bezona, personal communication, 1987). Agricultural water rates run 89 cents/1000 gallons (per 3780 liters) for the first 10,000 gallons (37,800 l), $1.40/1000 gallons for the next 40,000 gallons (60,480 l) and 94 cents/1000 gallons more than 50,000 gallons (189,000 l). Non-agricultural water rates are 89 cents/1000 gallons for the first 10,000 gallons and $1.04/1000 gallons for more than 10,000 gallons. (County of Hawaii, Department of Water Supply, personal communication, 1988).

At elevations higher than the agricultural belt, between 2,000 and 5,000 feet (608 and 1520 m), lies rainforest supporting endemic Hawaiian Ohia (*Ohia* spp.) and Koa (*Acacia koa*) trees. Koa is commercially logged and milled on a small scale. This belt serves as a sponge that absorbs and stores rain. Some of area has been cleared for cattle ranching. The tops of the mountains are sparsely vegetated. One species of Ohia and scrub grass have adapted to the high elevation tropical environment.

Kona's Farmers

Kona's population is ethnically diverse. A few Hawaiians and part-Hawaiians still farm, however, most left a generation ago for city jobs. The majority of people (40%) in Hawaii County are second and third generation Japanese immigrant children. The next largest group (15%) are Caucasians who immigrated to Hawaii from the island of Oahu and Mainland U.S. The next largest group (10%) are Filipinos who came to Hawaii during this century. (County of Hawaii, Department of

Planning, 1987). Descendants of early Portuguese, Spanish, and Puerto Rican settlers on the island are farmers.

During the early 1900s, children of Japanese immigrants who came to Hawaii as contract sugar workers, moved to Kona. They set up small-scale, subsistence farms on Kona's rocky slopes and raised coffee. Some of these immigrants still farm small acreages to supplement their retirement income.

Most children of older Kona farmers have either left the island in search of employment opportunities or work in the tourist industry. These children farm on a part-time basis. Some younger farmers have university degrees from the UHM or UHH and own small agricultural firms that manage farms for absentee landlords. During harvest season additional family members are called to help from Oahu and elsewhere.

A third group of farmers is composed of more recent immigrants from the Mainland U.S. (County of Hawaii, Department of Planning, 1987). They are usually younger, however, some are retirees. Their decisions are economically rather than culturally driven, with crop practices reflecting farmers' perceptions of potential economic gains. These farmers put investment capital into farming and often monocrop larger acreages. Labor is hired for day-to-day farm operation and during harvest season.

Most Kona farms are family operated. Decisions are shared by both women and men, although men probably have a stronger voice. Husbands and wives work together in the field.

Farmers in Kona stated that they are concerned about the viability of small-scale farms in Hawaii. They are community-oriented and have traditional rural outlook, friendliness and values.

Farming Operations

Hand labor is the most common source of labor. A few newer farmers use tractors. Mulching machines are common. Animals, except for chickens, dogs and cats, are uncommon on Kona's small farms. Donkeys, that once transported agricultural commodities, have been replaced by four wheel drive pickup trucks and jeeps.

Fertilizers and other inputs are supplied to retailers by large Hawaiian companies. Cooperatives and commodity processors sell fertilizer and lime to farmers. The most common fertilizer is "coffee cherry", which was a 2 to 1 to 4 formulation (10-5-20 or 14-7-28), and costs \$12-\$16 per 80 pound bag. Zinc, boron and iron have been added but many farmers are reluctant to change to a more expensive fertilizer (\$14.50-\$16 per bag).

Although pH's of below 4.0 are common, use of lime is limited. Dolomite costs about \$7.50 per 66 pound bag (30 kg) and crushed coral about half that, but is much less finely ground. Farmers question the value of lime and find its white appearance on the ground to be offensive. Farmers do not know that they have to use enough lime to obtain a meaningful change of pH. Incorporation of lime is hindered by the area's steep and rocky soils. Soil testing is increasing, however, the average farmer questions its value. Traditional farmers view government bans on herbicides and pesticides as bothersome and unnecessary, however, younger farmers prefer natural pest controls.

Roundup herbicide (the most common herbicide applied) costs about $88–$90 per gallon.

Credit sources include federal programs (e.g. Farm Home Administration and Production Credit Corporation), state programs, the Kona Community Federal Credit Union, private banks and mortgage institutions.

Crops Grown in Kona

In 1827, coffee was introduced in Kona and by the early 1900's was sold on the world market (Kona Coffee Council, 1987). During the 1950's, there were over 6,000 acres of coffee in Kona. Competition from foreign countries with lower production costs caused acreage to drop to 2,000 acres in the early 1980's. Because of the popularity of speciality gourmet coffees, acreage rose to over 3,000 acres by 1987, when over 850 farmers sold coffee (Janet Coburn, Executive Director, Kona Coffee Council, personal communication, 1988).

Many of Kona's coffee orchards are over 80 years old. The common variety is Guatemalan, however, a few farmers were trying Caturra, a variety introduced by UHMCTAHR in the late 1950's. Farmers attribute the fine taste of Kona coffee to Kona's mild climate and soil factors. It is one of the highest priced roasted coffees in the world and sells for $12–14 per pound.

Macadamia nut farming in Kona began in the 1940's and is replacing many coffee farms. Approximately 950 farmers sold macadamia nuts during the 1987–88 harvest season. Almost all (99%) macadamia nuts were produced on Big Island (Sally Rice, Executive Director, Hawaii Macadamia Nut Association, personal communication, 1988). Macadamia nut trees reached maturity after seven years of growth; and crop profitability (when returns exceed investment costs) occur between 16-18 years (Scott and Marutani, 1982). Grafted varieties can be purchased from local nurseries. Newer varieties are smaller than older varieties and Christmas tree-shaped.

Avocados are a relatively new commercial crop in Hawaii. Most avocados are consumed at home and not commercially marketed. The Hawaii Avocado Association (HAA) records indicate that there are approximately 450 avocado growers in the state (Howard Simon, Hawaii Avocado Association Chairman, personal communication, 1988). UHMCTAHR and HAA recommend using commercial varieties, however, many farmers raise non-grafted varieties. Avocados that are marketed as recommended varieties, command higher prices than fruit borne from seedling fruit because of large variation in seedling fruit quality and appearance.

Unfortunately coffee, macadamia nut and avocado harvests occur simultaneously. Coffee pickers at peak harvest earn $25-30 and macadamia pickers receive $5 per 100 pound bag.

<u>Agricultural Processing and Marketing</u>

Coffee cherry (the ripe fruit) is sold to six processors who processed it and sell "green" (unroasted) and roasted coffee locally, on the Mainland and Japan. Coffee cherry prices were moderate during the 1987-88 season at $ .50-.70 per pound and dependent on cherry quality, time of season, and payment schedule acceptable to the farmer. Macadamia nuts are sold to processors who process them locally for use in tourist products. Macadamia prices were high in 1987-88 (over $1 per pound in the shell) reflecting a poor spring flower set and increased market demand.

Thirty percent of all avocados bought in Hawaii are imported from California. The avocado industry is young and attempting to obtain certification for Mediterranean fruit fly fruit for export to Alaska, Canada, the Mainland and Japan. During 1987, one packer shipped the Sharwil avocado variety to Alaska. Avocado growers experienced poor fruit set and a short market season during 1987-88.

Agricultural commodities are shipped to Oahu via one barge company. The nearest harbor is at Kawaihae, about an hour's drive from Kona's agricultural zone. Boats leave Kawaihae every Monday and Thursday unless one of these days is a holiday, when only one trip is made. The Kona Chapter of the Hawaii Farm Bureau is completing a marshalling yard to assist in transporting and marketing Kona's agricultural commodities.

Kona is the state's largest coffee and avocado production region and has a large population of macadamia nut growers. Other farming activities include: vegetable farming, ornamental flowers, ranching, spices, citrus and other fruits. The Kona Regional Plan (County of Hawaii, Department of Planning, 1982) indicated expansion of the coffee industry was price dependent. Expanded agricultural production levels and marketing efforts are needed in order to expand the viability of Kona's other crops.

APPENDIX C

NARRATIVES OF MACADAMIA NUT AND AVOCADO COMPOSITE MIND MAPS

The analyst developed the following composite mind maps illustrating macadamia nut and avocado themes of concern for four groups of participants: KFC farmers, farmers in the TT group, extension service and other information sources, and researchers.

A. Macadamia Nut Concerns

Table 45 presents macadamia nut concerns mentioned by each group that appeared as legs of the composite mind maps (Figures 22, 23, 24, and 25). When discussing macadamia nut concerns most KFC farmers appeared nonchalant. Although they mentioned concerns, most were not overly troubled by any single concern. During the time of the research, they were receiving a high price due to increased demand and a shortage of supply. TT group farmers were businesslike in their approach to farming; often citing production statistics. Three of the five extension service and other information sources participants discussed only coffee concerns. The other two participants' macadamia nut and avocado concerns were presented on one composite mind map. They stated, in light of diminishing dollars being channelled to public

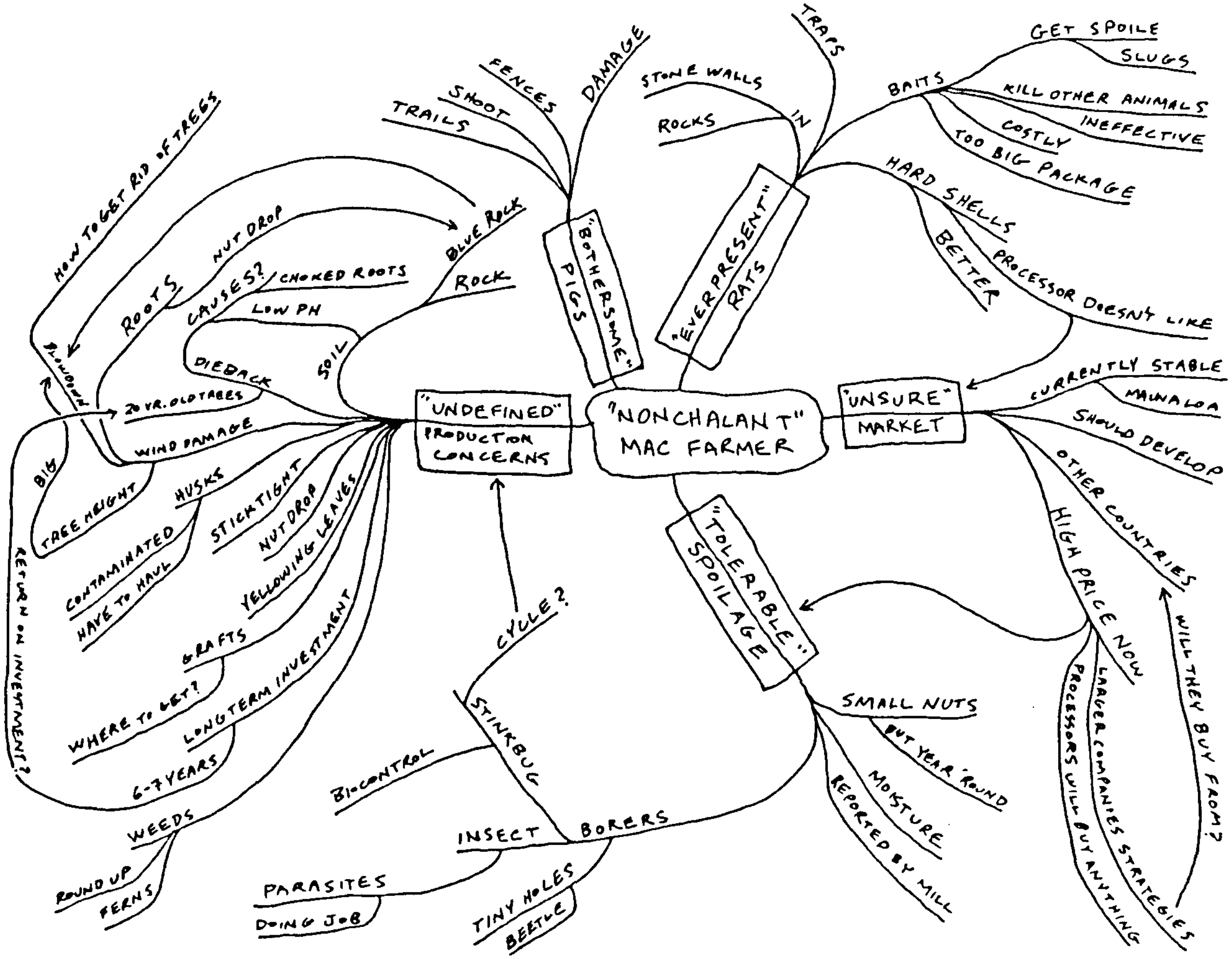

Figure 22. Macadamia Nut Concerns of KFC Farmers

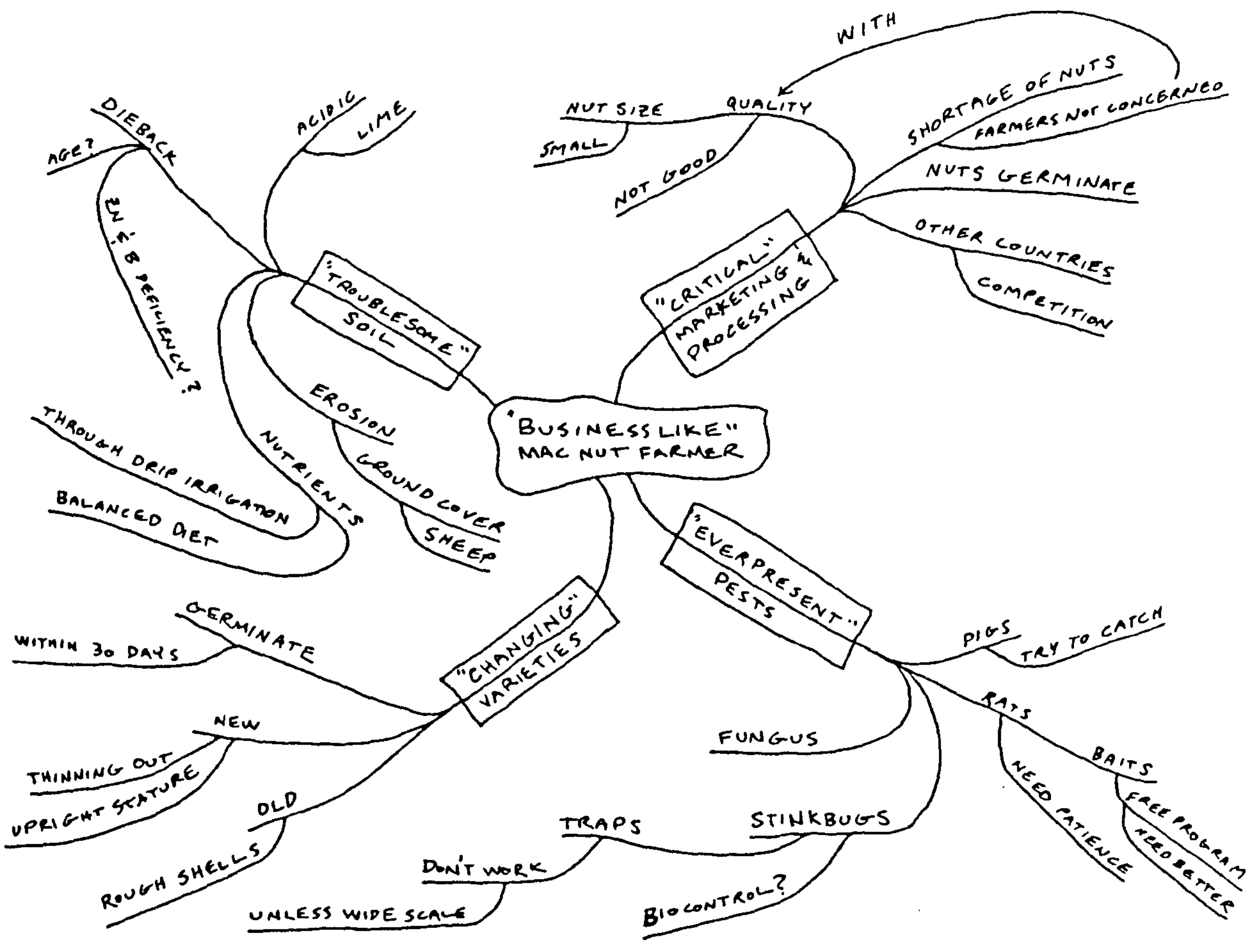

Figure 23. Macadamia Nut Concerns of TT Group Farmers

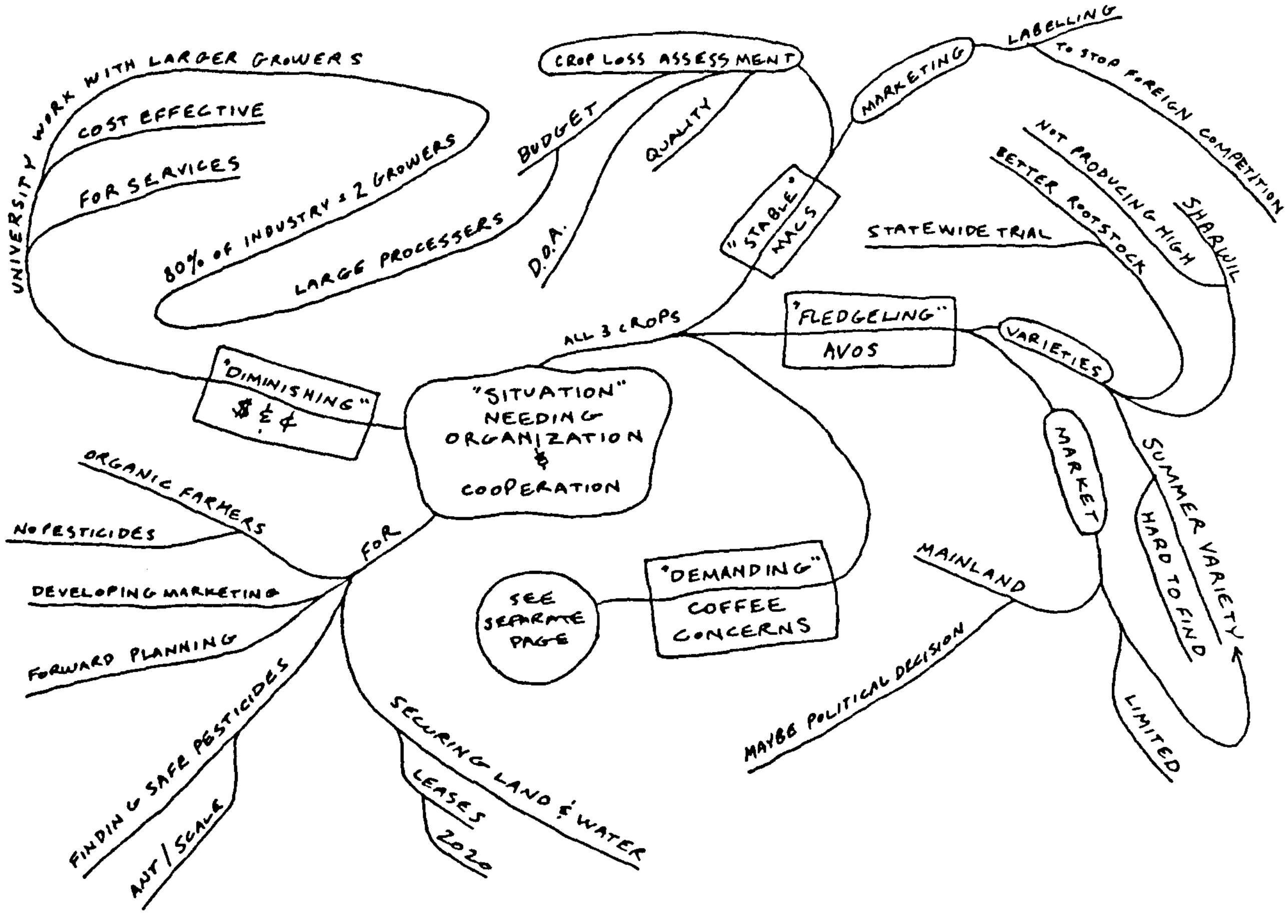

Figure 24. Macadamia Nut and Avocado Concerns of Extension Service and Other Information Sources

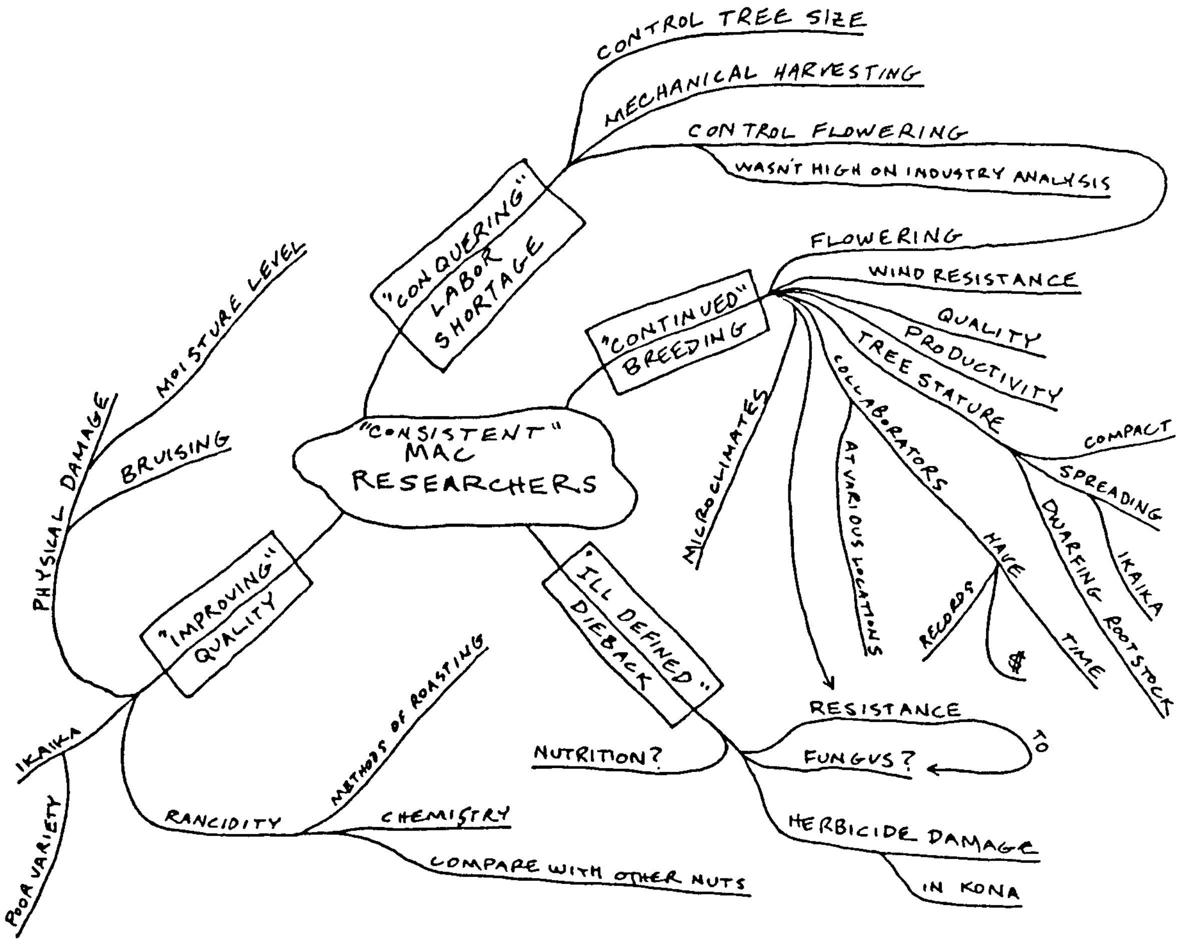

Figure 25. Macadamia Nut Concerns of Researchers

Table 45. Macadamia Nut Themes of Concern for KFC Farmers, TT Group Farmers, Extension Service and Other Information Sources and Researchers Illustrated as Legs of Composite Mind Maps

Theme of Concern	Appearing as KFC Farmer Mind Map Leg	Appearing as TT Group Farmer Mind Map Leg	Appearing as ESIOS[a] Mind Map Leg	Appearing as Researcher Mind Map Leg
Rats	X			
Pigs	X			
Pests in General		X		
Crop Loss Assessment			X	
Spoilage/Quality	X			X
Other Production Concerns	X			
Marketing	X	X	X	
Soil		X		
Varieties/Breeding		X		X
Dieback				X
Labor				X

[a] ESOIS - Extension Service and Other Information Sources

research, that industry-wide cooperation was needed. Composite mind maps constructed with information from researchers illustrated concerns about UHMCTAHR science-based projects.

a. Rats - Rats were mentioned most frequently (24 times) by KFC farmers. Four KFC farmers were concerned about killing other animals when they put bait and traps in their fields. Four farmers mentioned that baits were costly and available in packages that are too large for individual farm use, and, therefore spoil in storage. Eight farmers stated that baits were ineffective because rats grew immune to them. Six farmers mentioned that they preferred hard shelled macadamia nut varieties because the likelihood for damage was minimized. A state program that distributes zinc phosphide was mentioned by two farmers, however, they stated that the chemical's strong smell required using a respirator. Control methods farmers showed to the analyst were 1) metal strips around tree trunks so that rats couldn't climb the trees, 2) traps and 3) cats.

b. Pigs - Five KFC farmers told the analyst that they were bothered by pigs. Hunting, fencing and using poisoned defective macadamia nuts were mentioned as successful means of control.

c. Spoilage/Quality - KFC farmers were docked for spoilage due to moisture and other physical damage, however, they stated that they could live with their losses. Because of the macadamia nut supply shortage, one TT group farmer mentioned that farmers were not harvesting on time and old, germinating nuts were being delivered to processors.

Fourteen KFC farmers stated that insects caused a decrease in quality. Four farmers showed the analyst tiny holes in nut shells made by boring insects. Ten KFC and two TT group farmers stated that they had read UHMCTAHR literature about stink bug damage. Some requested more information from the analyst about means of controlling them. One TT group farmer stated that traps were not effective because they needed to be deployed on an area-wide scale. Another TT group farmer mentioned need for increased biocontrol.

One extension service and other information source participant mentioned that assessing crop losses was the industry's top IAP priority and a budget for distributing state funds was being determined. He stated that collaborative activities were planned between UHMCTAHR and DOA. This participant also stated that it was more cost effective for UHMCTAHR to work with the state's two largest companies that produced 80% of the industry's production than small-scale farmers.

Three researchers informed the analyst that the thrusts of the UHMCTAHR macadamia nut quality program program included examining: a) physical nut characteristics, b) poor varieties, c) rancidity, and d) prevention of spoilage. Macadamia nut characteristics were also being compared with those of other nuts.

d. Dieback - Six KFC farmers mentioned macadamia dieback concerns to the analyst. This condition produces branch necrosis when trees reach approximately twenty years of age. One KFC farmer described in great detail how macadamia nut production was an expensive, long-term investment. Other farmers pointed out that appreciable macadamia nut harvest begins after six to seven years and, if trees lived only twenty years, then the crop might not be profitable. KFC farmers attributed several factors to cause the condition including low soil pH and poor root penetration. One TT group farmer stated that dieback was possibly caused by Zinc or Boron deficiency. Although no program had been initiated, three researchers stated a need for additional research for determining if nutrition, disease, herbicide damage, or other factors were causing the dieback.

e. Soil - Three KFC farmers mentioned the rocky nature of Kona's soil. One KFC farmer mentioned that macadamia nut husks were a good soil amendment, however, the cost of hauling them from the mill was a deterrent. Erosion and subsequent ground cover projects were mentioned by four TT group farmers. Two TT group farmers told the analyst that they were applying lime for reducing acid soil conditions. The application of nutrients through drip irrigation was mentioned by one farmer.

f. Other Production Concerns - Five KFC farmers told the analyst that macadamia nut trees had shallow root systems and every eight to ten years Kona received winds strong enough to topple trees. They were bothered by disposing of fallen trees. Four farmers mentioned that macadamia nut trees were too tall and stated that pruning them was dangerous. Three farmers told the analyst that they were concerned about sticktight, a condition where nuts fail to dehisce and fall to the ground for harvesting. Weeds were usually treated with Round-up herbicide which added to production costs. Two farmers mentioned that leaves made good mulch, however, a machine was needed. One farmer complained that environmental laws made burning of leaves difficult.

g. Marketing - Eight KFC farmers told the analyst that marketing efforts should be undertaken by the whole industry because other counties will soon begin producing nuts. Some farmers mentioned that they were concerned if large processors would continue buying Hawaiian nuts or switch when foreign production was available.

h. Varieties - Two TT group farmers, also processing nuts, stated that older varieties had undesirable rough shells. Most KFC and TT group farmers mentioned that they liked large nuts because they were easy to harvest. One farmer mentioned that nuts of newer UHMCTAHR developed varieties could germinate within thirty days. Four researchers mentioned that current breeding efforts began during the

1940's. They informed the analyst that varietal improvement programs focussed on a) wind resistance, b) quality, c) productivity, d) tree stature (compact tree canopies and dwarf rootstock made harvesting easier), e) increased and controlled flowering, and f) adaptability to various microclimates found in the Hawaiian islands.

i. Harvest Labor - One researcher mentioned that coffee labor shortages also affected macadamia nut harvesting. He stated that mechanical harvesting was a possible "solution" for the problem, but dependent on controlling macadamia nut flowering to permit simultaneous harvesting. This researcher pointed out this had not rated high on the IAP, therefore, funding would not be available for expanding research efforts.

2. Classification of Macadamia Nut Themes of Concern

Table 46 presents the nature of macadamia nut concerns for the four viewpoints as classified by the analyst. She classified pest concerns (rats, pigs and insects) as primary-task concerns because both groups of farmers mentioned that they had to put out baits, build fences and use pesticides whenever pest populations were high. Some KFC farmers mentioned that KFC should provide baits in smaller containers to accommodate their small acreages. Farmers felt that it was the task of UHMCTAHR to develop and disseminate information on new technologies and methods available.

The analyst used the same rational for classifying soil concerns. Farmers should try new ideas developed by UHMCTAHR for maintaining soil fertility and addressing soil rockiness.

Table 46. Classification of Macadamia Nut Themes of Concern

Concern Presented on Composite Mind Maps	Classification of Concerns by KFC Farmers	TT Group	ESOIS[a]	Researchers
Rats	P1			
Pigs	P2			
Pests in General		P2		
Crop Loss Assessment			P2	
Undefined Production Concerns	P4			
Marketing	I1, I2	P3	I1	
Spoilage/ Quality	I3			P2
Soil		P2		
Varieties /Breeding		P2		P2
Dieback				P4
Labor				I3

I1 - Issue-based, Industry survival
I2 - Issue-based, Long-range planning
I3 - Issue-based, Generic
P1 - Primary-task, Mission of farmers, KFC and UHMCTAHR
P2 - Primary-task, Mission of farmers and UHMCTAHR
P3 - Primary-task, Mission of KFC and processors
P4 - Primary-task, Mission of UHMCTAHR

[a]ESOIS - Extension Service and Other Information Sources

She classified examining undefined production concerns as primary-task oriented because farmers stated that it was as the task of UHMCTAHR to look into them.

The analyst classified KFC farmer concern about market uncertainty as an issue-based concern because it required long-range planning and it pertained to continued industry survival, especially since foreign countries were beginning to produce macadamia nuts. This concern was seen in another light by the TT group farmers because their concerns focussed on the actual tasks associated with marketing and processing nuts, which was the responsibility of KFC and independent macadamia nut processors. The analyst classified extension service and other information sources' marketing concerns as issue-based because they dealt with the survival of the industry, especially because foreign nuts were being imported and sold as Hawaiian products.

KFC farmer spoilage concerns were considered as issue-based because spoilage lowered the amount of supply that was available to the processors, thus limiting industry expansion.

The analyst classified TT farmers' varietal concerns as primary-task concerns because it was the mission of farmers and UHMCTAHR to jointly develop new varieties. Farmers could increase planting densities because trees of the newer varieties were smaller and more compact. The analyst classified researcher concerns about breeding, dieback and quality as primary-tasks of UHMCTAHR. UHMCTAHR's staff with scientific background could undertake research activities most cost effectively. Collaborating farmers could assist by undertaking on-farm trials.

Assessing crop losses was classified by the analyst as primarily the task of collaborating growers and UHMCTAHR.

The analyst classified addressing the shortage of labor to be a generic issue-based concern of UHMCTAHR and farmers because researchers mentioned that they wanted to develop controlled flowering for assisting mechanical harvesting because they thought it was important.

B. Avocado Concerns

Table 47 presents avocado concerns mentioned by each group that appeared as legs of the composite mind maps (Figures 24, 26, 27, and 28). Although most KFC farmers did not commercially produce avocados, they consumed them at home. Six KFC farmers did not discuss avocados during their interviews. Many of the TT group stated that avocados could hold future market potential. Four of them were involved primarily with avocado production and marketing; three raised avocados and other crops and two did not have trees mature enough to bear fruit. One extension service and other information sources participant described the avocado industry as "fledgling" because it was still not firmly established and that only a few farmers participated in HAA.

1. Identified Avocado Themes of Concern

a. Quality - The analyst learned that Hawaiian avocados came in many sizes, shapes, ease of bruising, percent oil, skin and flesh textures, and skin colors. Thirteen KFC farmers mentioned that the lack of uniform avocado quality made it difficult to develop a commercial industry. Participants stated that consumers had little assurance when they bought Hawaiian avocados that they were buying high quality fruit. Two researchers informed the analyst that a UHMCTAHR quality testing program was underway. It was available for farmers to submit fruit not of a known variety (seedling) and for evaluating fruit from statewide trials.

b. Varieties - Sixteen KFC farmers stated that avocado varieties needed to be standardized in order to overcome quality and marketing problems. Wholesalers told the analyst that thick skinned

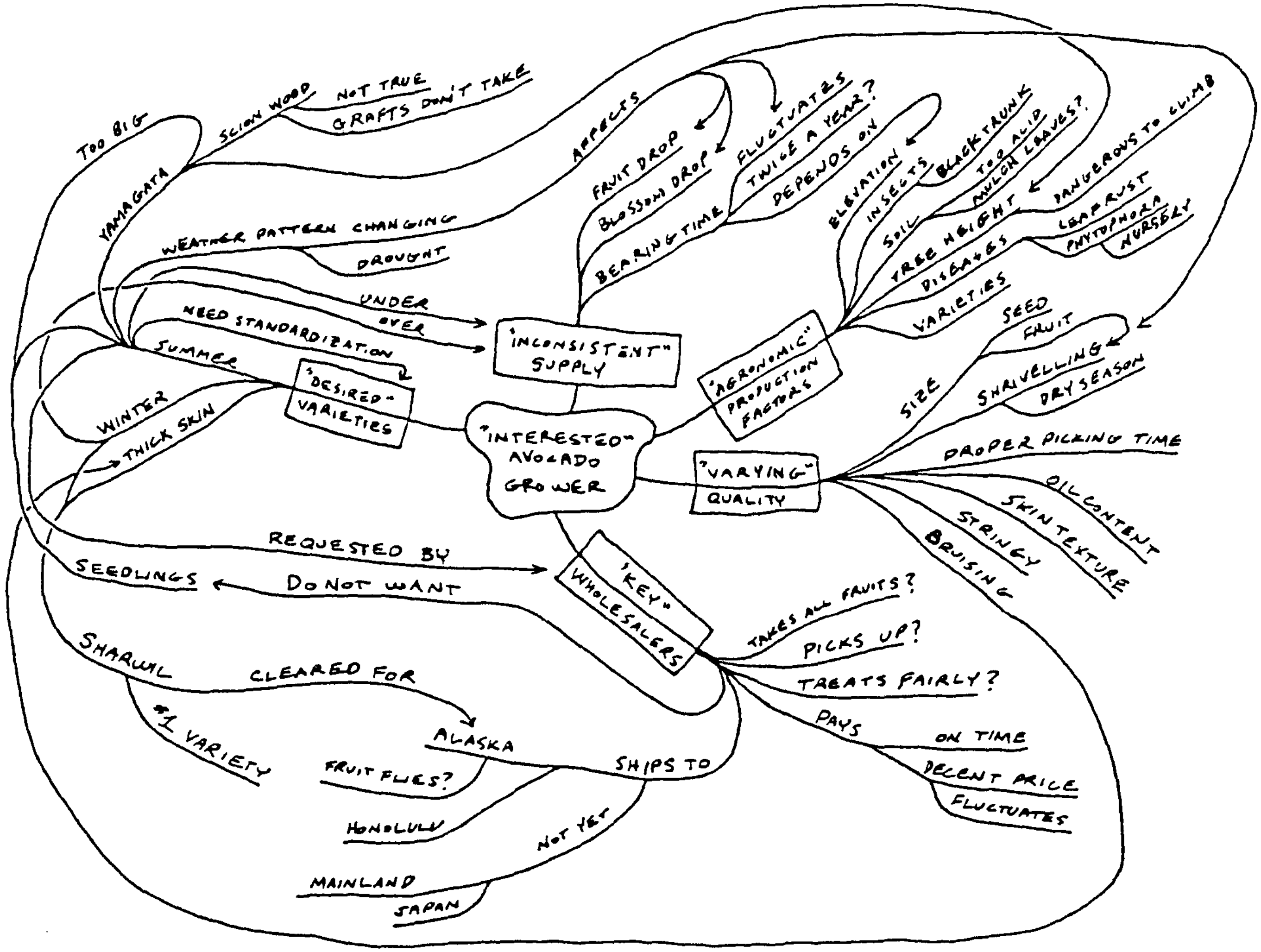

Figure 26. Avocado Concerns of KFC Farmers

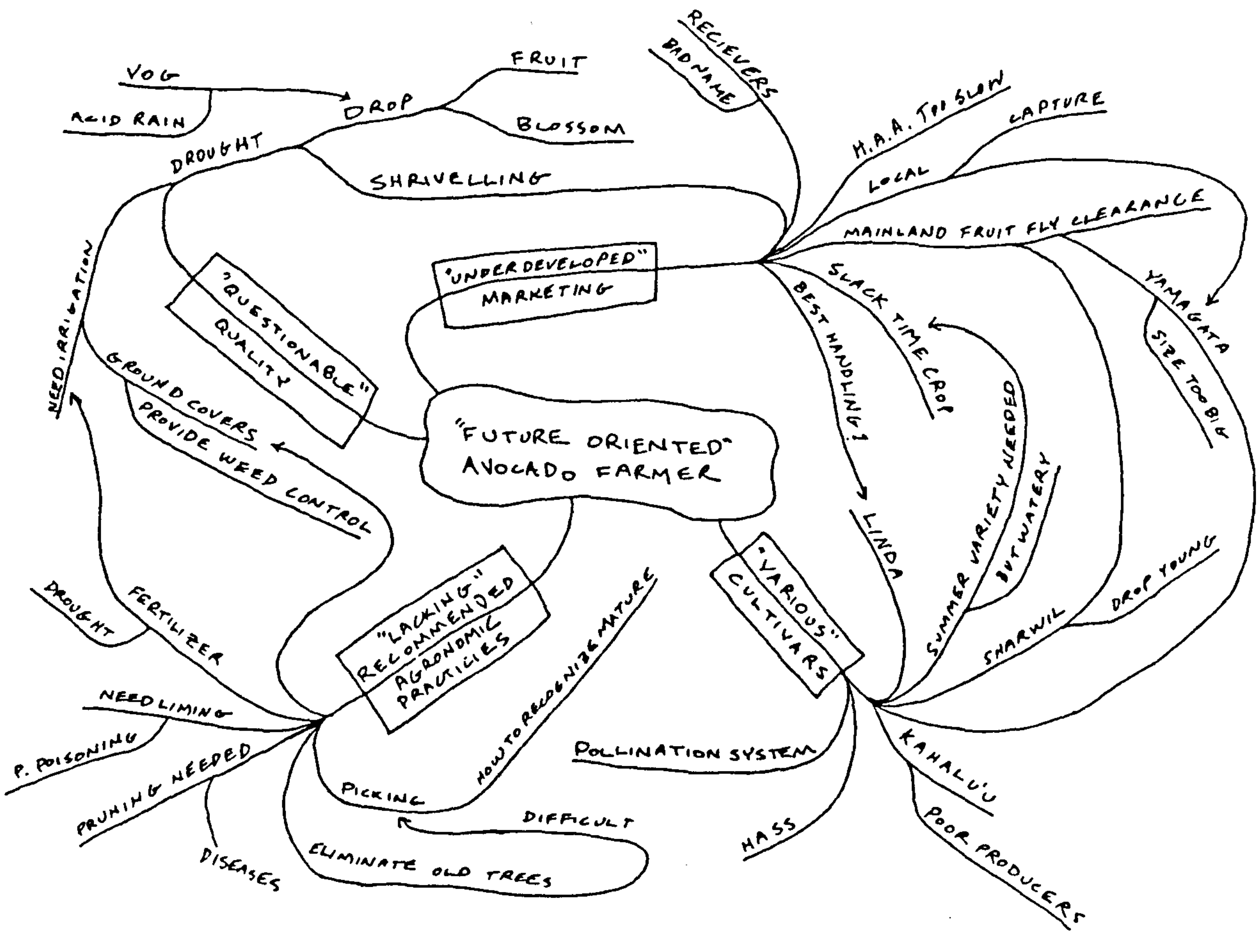

Figure 27. Avocado Concerns of TT Group Farmers

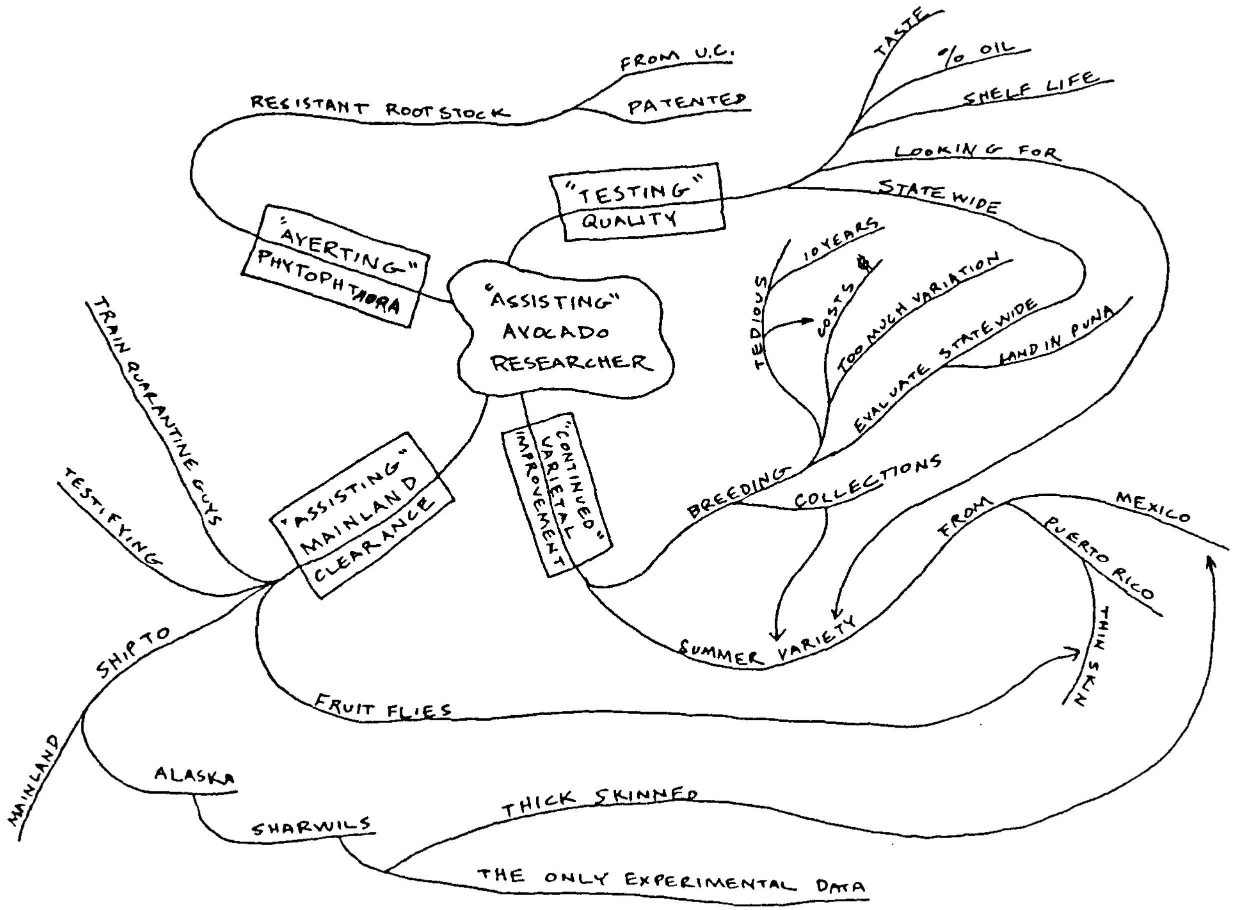

Figure 28. Avocado Concerns of Researchers

Table 47. Avocado Themes of Concern for KFC Farmers, TT Group Farmers, Extension Service and Other Information Sources and Researchers Illustrated as Legs of Composite Mind Maps

Theme of Concern	Appearing as KFC Farmer Mind Map Leg	Appearing as TT Group Farmer Mind Map Leg	Appearing as ESIOS[a] Mind Map Leg	Appearing as Researcher Mind Map Leg
Quality	X	X		X
Varieties	X	X	X	X
Marketing/Supply/ Mainland Clearance	X	X	X	X
Wholesalers	X			
Production Factors/ Phytophthora	X	X		X

[a] ESOIS - Extension Service and Other Information Sources

varieties shipped better than thin skinned ones which bruised easily. Participants told the analyst that fruit ripened during winter causing seasonal over production. KFC farmers stated that scion wood of Yamagata, a summer variety, did not always uniformly express itself and that its fruit was too large. The analyst learned from participants that Sharwil was Hawaii's preferred variety, however, three TT group growers noted that it tended to drop immature fruit. Two KFC farmers stated that they believed that changing weather patterns (persistent drought conditions) caused fruit and blossom drop and shrivelled fruit.

c. Marketing/Supply - Marketing concerns were mentioned in conjunction with finding good summer varieties. Nine KFC farmers stated that inconsistent supply affected avocado marketing since winter varieties were mainly available. One researcher told the analyst, in response to the industry's expressed need for expanding exports to

Alaska, that he had testified that Sharwil's was not a host for fruit flies. Participants told the analyst that they hoped for additional clearance to the Mainland U.S. and Japan. Two TT group farmers stated that Kona producers should meet local demand first.

d. Wholesalers - Only four KFC farmers were commercially growing avocados. Wholesale buyers (shippers) told the analyst that their relationship with farmers was highly personal and that they did not wish to reveal who their producers were. KFC farmers raised concerns about arrangements with shippers; that shippers needed: to buy all the farmer's fruit; to pick it up at the farm; to treat the grower fairly, and to pay on time and at a reasonably consistent price. They told the analyst that wholesalers wanted fruit from recognized commercial varieties. Wholesalers stated that they had not receive much summer fruit.

e. Production Factors - Two KFC farmers mentioned concerns about insects burrowing into tree trunks, making them appear blackened. Four KFC farmers mentioned that avocado trees were often too tall, making harvesting dangerous and that farmers should prune them. Five KFC and four TT group farmers mentioned disease concerns related to leaf rust and *Phytophthora*. Two researchers mentioned needing resistant rootstock for averting *Phytophthora*. Six KFC farmers reported that drought and related irrigation needs affected production. Four KFC farmers mentioned grafts which had not been successful. One TT group farmer said that he found it difficult to recognize when fruit was ripe enough for picking. One researcher informed the analyst that elevation effected varietal expression.

2. Classification of Avocado Themes of Concern

Table 48 presents the nature of avocado concerns for the four viewpoints as classified by the analyst. She considered quality concerns as primary tasks of farmers, wholesalers, retailers and UHMCTAHR because 1) farmers should not sell inferior quality fruit, 2) wholesalers and retailers should maintain fruit quality through the marketing chain so that consumers received a high quality product and 3) UHMCTAHR should provide information about how to identify and maintain high quality fruit. KFC farmer, TT group, and researcher concerns about quality and varieties were also classified as issue-based because these factors limited the growth of a commercial Hawaiian industry.

The analyst classified concerns related to varieties as primary-task oriented because they involved the function of UHMCTAHR and farmers to identify desirable avocados. UHMCTAHR researchers were responsible for collecting varieties from outside Hawaii, screening them and distributing them to Kona's farmers for on-site evaluation. Farmers should also participate by identifying promising local seedling trees and sending them to UHMCTAHR for evaluation.

Market development concerns of KFC farmers were viewed as issue-based because they involved long-range planning (a commitment to the avocado industry) by farmers. The analyst classified market concerns as issue-based for TT group farmers because they considered marketing crucial for industry survival. Concerns associated with avocado Mainland clearance were classified by the analyst as primary-task oriented because it was related to the mission of

Table 48. Classification of Avocado Themes of Concern

Concern Presented on Composite Mind Maps	Classification of Concerns by KFC Farmers	TT Group	ESOIS[a]	Researchers
Quality	P1,I1	P1,I1		P1,I1
Varieties	P2	P2,I1	P2	P2,I2
Marketing/ Supply/ Mainland Clearance	I2	I1	I1	P4
Wholesalers	I3			
Production Factors/ Phytophthora	P2	P2		P3

I1 - Issue-based, Industry survival
I2 - Long-range planning
I3 - Issue-based, Generic
P1 - Primary-task, Mission of farmers, wholesalers, retailers and UHMCTAHR
P2 - Primary-task, Mission of farmers and UHMCTAHR
P3 - Primary-task, Mission of UHMCTAHR
P4 - Primary-task, Mission of wholesalers and UHMCTAHR

[a]ESOIS - Extension Service and Other Information Sources

wholesalers wanting to market avocados. UHMCTAHR was responsible for supporting the industry's efforts by undertaking research and testifying at hearings.

The analyst viewed KFC farmer concern about wholesalers as an issue-based concern because it dealt with their business management practices. They were operated on a personal basis with each farmer.

Addressing production factors was viewed by the analyst as a primary-task concern of 1) UHMCTAHR because it could conduct scientific research and 2) farmers because it was up to farmers to use improved production practices. The analyst classified researcher Phytophthora concerns as the primary task of UHMCTAHR because they could investigate resistant rootstock and other control methods.

C. Determining the Relative Importance of Themes of Concern and Comparing Them With IAP Bottlenecks

The analyst counted the number of times a concern was mentioned on her individual mind maps to determine its relative importance. The number of times each macadamia nut and avocado concern was mentioned by KFC farmers and TT group participants and its rank among other mentioned concerns are presented in Tables 49 and 50.

The analyst noted some IAP bottlenecks addressed action (hows) needed to "solve" problems rather than what an improved situation might look like when she compared IAP bottlenecks with concerns identified by this study (Tables 49 and 50). Crop loss assessment (the number one macadamia nut IAP bottleneck) involved applying techniques for determining how much of the crop was lost to various factors, rather than concentrating on what those factors meant to producers and processors. Soft system's Stage Two techniques employed both quantitative and qualitative methods for identifying and evaluating participant concerns. Other macadamia nut IAP bottlenecks that indicated proposed actions to solve problems included: registering pesticides and product labeling and packaging.

The avocado IAP also reflected some "how" type bottlenecks: 1) lack of standardization in cultivars, quarantine regulations for mainland export, and lack of adequate transportation facilities were lines of action that enhance marketing, 2) lack of cooperative testing

Table 49. Frequency and Rank of Macadamia Nut Concerns Mentioned by KFC Farmers and TT Group Participants

Concerns	Frequency of KFC Farmer Responses	KFC Farmer Rank	Frequency of TT Group Responses	TT Group Rank
Rats	24	1	1	8
Insects	14	2	4	3
Soil	8	3	2	7
Marketing	8	3	3	5
Quality	7	5	5	2
Varieties	6	6	6	1
Dieback	6	6	4	3
Wind	5	8	1	8
Pigs	5	8	1	8
Pruning	4	10	3	5
Sticktight	3	11	0	13
Herbicide Damage	3	11	1	8
Leaves	2	13	0	13
Harvesting	0	14	1	8

Table 50. Frequency and Rank of Avocado Concerns Mentioned by KFC Farmers and TT Group Participants

Concerns	Frequency of KFC Farmer Responses	KFC Farmer Rank	Frequency of TT Group Responses	TT Group Rank
Varieties	16	1	12	1
Quality	13	2	5	3
Marketing	9	3	12	1
Drought/Irrigation	6	4	3	6
Diseases	5	5	4	4
Blossom Drop	4	6	4	4
Tree Height	4	6	2	8
Grafting	4	6	0	10
Elevation Effects	2	9	1	9
Insects	2	9	3	6

of promising selections indicated a need for increased farming assistance, and 3) lack of fungicides for postharvest diseases and lack of information on disease control through rootstock and soil modification were designed for handling disease concerns.

The analyst identified non-congruence with macadamia nut and avocado concerns identified by this study and IAP bottlenecks (Tables 51 and 52). Macadamia nut "rat concerns" ranked ninth out of the twelve possible IAP bottlenecks. They were the most important KFC farmer concerns. Soil concerns, ranked third highest by KFC farmers, were ranked last on the IAP list of bottlenecks. Pesticides and herbicides did not seem of top importance to KFC farmers when interviewed.

The avocado IAP did mirror KFC farmers main concerns about obtaining summer varieties for improving Hawaii's summer production so that marketing would be enhanced. The lowest priority IAP bottleneck, lack of water and low-cost water, was ranked fourth highest by KFC farmers in this study, probably reflecting the fact that the drought had continued for an additional two years after the IAP was conducted.

Table 51. Comparison of KFC Farmer Macadamia Nut Concerns and IAP Bottlenecks

Bottlenecks Identified by the March 1987 Macadamia Nut Industry Analysis	IAP Priority	This Study's Concerns	KFC Farmer Rank
Crop Loss Assessment*	1	Insects	2
Disease Control	2		
Foreign Production and Market Potential	3	Marketing	3
Introduced Pests	4	Insects	2
Registering New Pesticides*	5	Herbicide Damage	11
Increasing Processing Efficiency	6		
Industry Organization	7	Farming Assistance	
Nutrition	8		
Rat Control	9	Rats	1
Product Labeling and Packaging*	10	Marketing	3
Macadamia Biology	11		
Erosion Control	12	Soils	3
		Additional Concerns	
		Quality	5
		Varieties	6
		Dieback	6
		Wind	8
		Sticktight	11
		Leaves	13
		Harvesting	14
		Pigs	8
		Pruning	10
		Farming Assistance included as non-crop specific concern	

*indicated HOW to solve a problem rather than identifying WHAT was the concern

Table 52. Comparison of KFC Farmer Avocado Concerns and IAP Bottlenecks

Bottlenecks Identified by the May 1985 Avocado Industry Analysis	IAP Priority	This Study's Concerns	KFC Farmer Rank
Lack of Standardization in Cultivars*	1	Marketing	3
Inadequate Marketing and Promotion	2	Marketing	3
Quality Fruit Year-Round	3	Quality/Varieties	2
Lack of Cooperative Testing of Promising Selections*	4	Farming Assistance	
Insufficient Summer Varieties	5	Varieties	1
Quarantine Regulations for Mainland Export*	6	Marketing	3
Lack of Fungicides for Postharvest Diseases*	7	Diseases	5
Lack of Information on Postharvest Handling	8	Marketing	3
Lack of Updated Production Information	9	Farming Assistance	
Lack of Information on Elevation, Irrigation and Nutrition on Yield and Harvest Season	10	Elevation Effects Drought/Irrigation	9 4
Lack of Adequate Transportation Facilities*	11	Marketing	3
Lack of Low-Priced Land	12	Land	
Lack of Information on Disease Control Through Rootstocks and Soil Modification	13	Disease	5
Lack of Water and Low-Cost Water	14	Drought/Irrigation	4
		Additional Concerns	
		Blossom Drop	6
		Tree Height	6
		Grafting	6
		Insects	9
		Farming Assistance and Land included as non-crop specific concerns	

*indicated HOW to solve a problem rather than identifying WHAT was the concern

APPENDIX D

DISCUSSION OF A MODEL TO MAINTAIN THE QUALITY OF AND MARKET KONA COFFEE SYSTEM

A subgroup of participants developed a model pertaining to the need to maintain the quality of and market Kona coffee. The subgroup, representing various ages, ethnicity and farmer types, helped develop this model and consisted of seven KFC participants, two of their wives and six of the TT group. The analyst used a shuttle approach by visiting and revisiting the subgroup during the week and a half it took for gathering preliminary model information. Most were extremely busy as coffee harvest was in full swing. She was unable to meet with the KFC manager.

Table 53 presents a statement developed by participants mentioning coffee quality and marketing concerns during Stage Three's CATWOE exercise. Twenty participants mentioned these two concerns together, therefore, they were examined as one system with two subsystems. The two subsystems interacted; marketing activities resulted in demand for high quality coffee. Participants stated that marketing activities were essential for expanding Kona's share of the gourmet coffee market.

Table 53. A Relevant System and Root Definition Statement For Kona Coffee Quality and Marketing Concerns

Relevant System:
A system to maintain the quality of and market Kona Coffee.

Root Definition:
A privately owned system to maintain the quality of and market Kona coffee that operates under the following environmental constraints that it takes as givens:
1) Farmers and processors tend to be independent, having various procedures to grow, process and market coffee. Farmers and processors may be reluctant to change.
2) Resources (especially land, water and labor) are limited and economic conditions may not favor coffee production.
3) The physical environment may affect coffee flavor.
4) Coffee tends to bear heavy in alternate years.
5) There is a limit to the amount consumers will pay for Kona coffee. Alternative competitor gourmet coffees are available.
6) Kona coffee is blended to produce lower priced products for markets which can not afford pure Kona coffee.
7) Large agribusinesses on other Hawaiian islands are currently planting coffee. The State's view is not only for Kona.
8) Quality is a subjective characteristic.

This system is carried out by the following actors:
Farmers, farm organizations, processors, UHMCTAHR, DOA, coffee buyers, roasters, and cuppers.

It directly affects the following customers:
Beneficiaries: farmers, processors, consumers, sellers and UHMCTAHR and
Victims: competitor coffee producers and marketers as well as producers (farmers) with poor quality coffee.

The worldview that makes this transformation meaningful contains at least the following elements among others:
1) Growing, processing and marketing is a desirable way of life for members of the Kona community. Agriculture is viewed as a worthwhile industry which compliments tourism. Therefore, industry continuation is economically important for the community.
2) Kona's reputation for high quality and distinctive taste must be maintained.
3) Increased sales will result from marketing efforts.
4) The number of gourmet coffee drinkers is increasing.
5) The industry must work together to protect the Kona coffee name and maintain its market share.

The analyst began Stage Four by discussing CATWOE transformations recorded during Stage Three's and asking subgroup members which ones were most important for maintaining coffee quality and marketing. During this time, two subgroup participants questioned if maintaining "quality" was the best word to describe the system's end state and suggested that maintaining a good "consistency" might be more appropriate because all Kona coffee marketed had to meet a standard for high quality. The analyst was unable to resolve this difference in wording and offered the choice as to which was better to participants interviewed during Stage Six debates.

Table 54 presents activities determined by the subgroup as essential for maintaining the quality of and marketing Kona coffee. It identifies actors that the subgroup envisioned would be responsible for undertaking these future activities. Figure 29 presents a visual presentation of the system model. The analyst compared this model's system components with those described on pp. 23-24. Tables 55-64 present system and sub-subsystem components. Components for the maintaining the quality of and marketing subsystems are not presented because subgroup participants focussed their discussions on sub-subsystem activities.

Table 54. Sub-subsystem Activities and Actors Responsible in the Future for A System to Maintain the Quality of and Market Kona Coffee

Sub-subsystem Activities	Actors Responsible in Future
Growing Quality Coffee	
Establishing the crop	Farmers
Protecting the crop	Farmers
Feeding crop	Farmers and Farm Orgs
Ensuring land and water availability	Elected Officials and Farm Orgs
Securing Quality Cherry	
Delivering best beans	Farmers
Determining quality	Processors
Providing rewards for high quality	Processors
Transferring and Storing Cherry/Coffee	
Transporting cherry	Farmers and Processors
Storing coffee properly	Farm Orgs
Distributing coffee	Processors
Evaluating Parchment and Coffee	
Determining when parchment is ready	Parchers and Processors
Setting standards for Kona Coffee	Private Biochemist or UHMCTAHR
Processing, Roasting and Brewing Coffee Correctly Improving procedures	Farmers, Processors, UHMCTAHR, Roasters, Retail Sellers, and Consumers
Evening-out Supply	
Evenly producing coffee	Farmers
Releasing correct amount for sale	Processors, Roasters and Coffee Brokers
Pursuing Industry-wide Concerns	
Working together	KCC and Other Farm Orgs
Defining blend labelling	KCC
Developing Products and Market Campaigns Deciding on nitches for Kona Coffee Undertaking promotional activities	KCC, DOA, Processors, Wholesalers, and Retailers

Farm Orgs = Farm Organizations

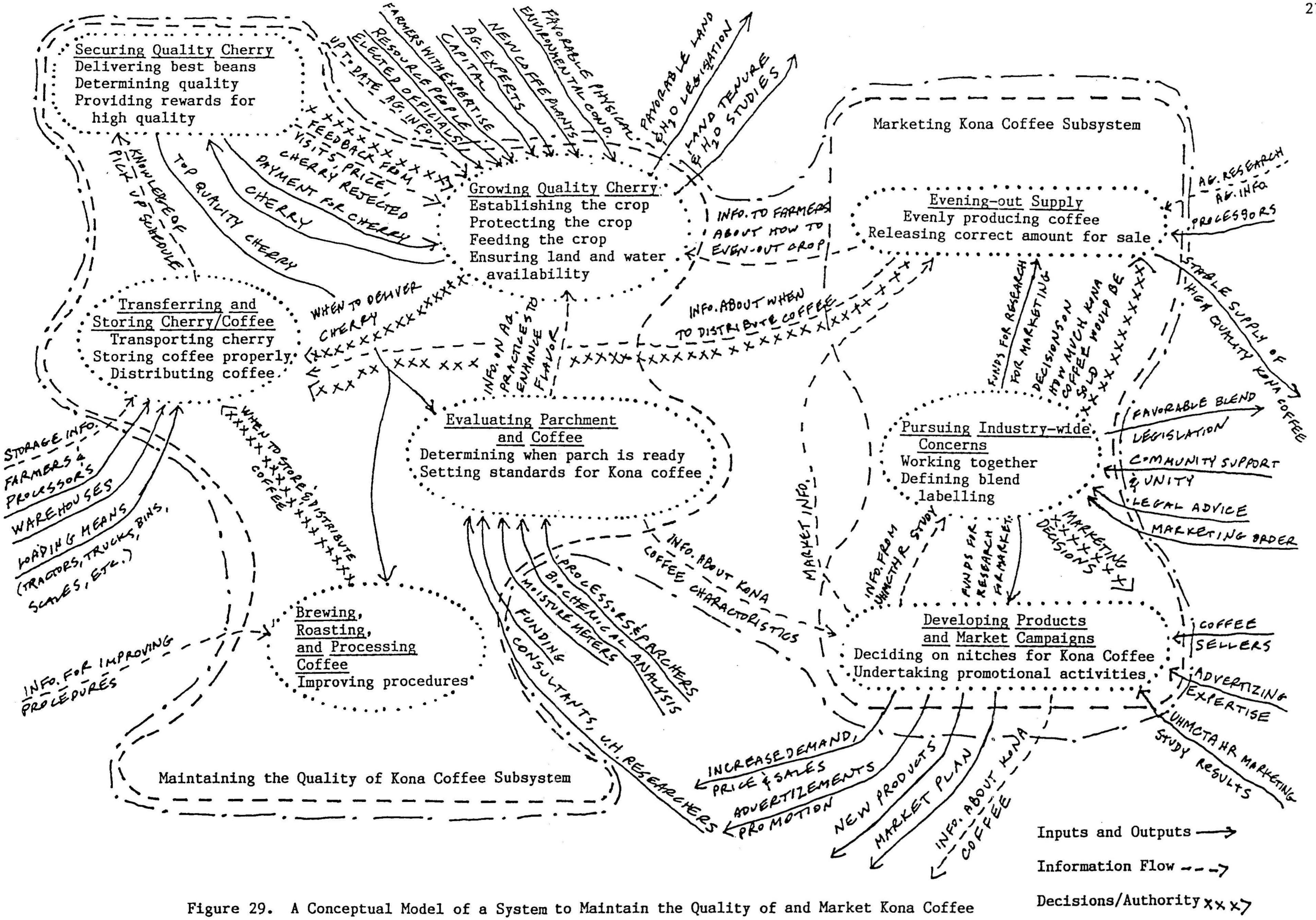

Figure 29. A Conceptual Model of a System to Maintain the Quality of and Market Kona Coffee

Table 55. Components of a System to Maintain the Quality of and Market Kona Coffee

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Objective, Purpose, Mission, or Desired Final State

To maintain the quality of and market Kona coffee because agriculture is a desirable economic and social activity in Kona. Sustaining the coffee industry would maintain the viability of the community's way of life. Agricultural activities would complement tourism by providing a second income for employees of the tourist industry and supplement tourism by increasing the number of tourist activities.

Measure of Performance

If Kona coffee could compete with other gourmet coffee by carving a large enough market share to sustain the local coffee industry.

Subcomponents and Sub-subcomponents

1) Maintaining Quality of Kona Coffee
   a) Growing Quality Cherry (Table 55),
   b) Securing Quality Cherry (Table 56),
   c) Transferring and Storing Cherry/Coffee (Table 57),
   d) Evaluating Parchment and Coffee (Table 58),
   e) Processing, Roasting and Brewing Coffee (Table 59),
2) Marketing Kona Coffee
   a) Evening-out Supply (Table 60)
   b) Pursuing Industry-wide Concerns (Table 61), and
   c) Developing Products and Market Campaigns (Table 62).

Interaction (Information Flow)

Components will interact with each other as described in Tables 55-62.

Exists in Wider Systems

Although agriculturally focussed, this system would be part of wider community, county, state, national and international systems - e.g.

1) DOA's Island Fresh program promotes all Hawaiian agricultural commodities, including coffee,

2) private entities (e.g. KFC) market other commodities in addition to coffee, and

3) Kona's natural environment provides excellent physical conditions for coffee production.

Table 55. (Continued) Components of a System to Maintain the Quality of and Market Kona Coffee

Decisions/Authority

At each stage of the system, a transaction would result that would require decisions:
1) Farmers would decide when to pick and deliver cherry,
2) Processors would decide if cherry was of high enough quality to process,
3) Parchment makers (parchers) and processors would decide if parchment was dry enough for milling into green coffee,
4) Brokers would decide if green coffee was processed correctly, how much of it they could buy and where and when it would be shipped,
5) KCC and/or a marketing order committee would decisions about coffee supply and market campaigns,
6) Roasters would decide roasting schedules, and
7) Brewers would decide how to prepare coffee.
Decision takers would also include: coffee brokers, roaster, retail sellers and brewers, however, because this study was limited geographically to Hawaii, information from these actors was unavailable.

Resources

1) Human resources (actors) would include: farmers; coffee pickers; KFC and PCC staff; private coffee processors, brokers, roasters and brewers; UHMCTAHR and other state organization staff; farm organizations, and retail businesses,
2) Funding would be provided by a marketing order.

Continuity

1) Coffee has been produced, processed and marketed in Kona since the late 1890's.
2) There will always be some people who desire Kona coffee.
3) Quality must be maintained in order to sell Kona coffee as a gourmet coffee.

Table 56. Components of a Sub-subsystem to Grow Quality Cherry

---

Objective, Purpose, Mission, or Desired Final State

To produce high quality cherry for processing. Outputs would include quality cherry, land tenure and water studies and favorable land and water legislation.

Measure of Performance

1) The grade and/or price received when cherry is delivered to processors and
2) If adequate land and water is available for farmers to raise coffee.

Subcomponents

1) Establishing the crop,
2) Protecting the crop,
3) Feeding the crop, and
4) Ensuring land and water availability.

Interaction (Information Flow)

1) Farmers would receive information about:
   a) new production technologies and practices
   b) how to "even-out" coffee's natural tendency to bear heavy in alternate years.
   c) the grade/price that their coffee earned, and
2) Farmers would tell their processor how much coffee cherry to expect from their farms.

Exists in Wider Systems

1) Growing coffee exists in a range of other farming activities.
2) Other systems (e.g. tourism, land conservation) compete for Kona's limited land and water resources.
3) Another system would provide information and technology pertinent to Kona's agricultural needs.
4) Biological systems would affect coffee productivity and quality.

Decisions/Authority

1) Farmers would decide production, picking and delivery operations that affect cherry quality.
2) Farmers, farm organizations, and elected officials would determine steps needed for ensuring land and water availability.

Resources

1) Human resources would include: farmers, elected officials, UHMCTAHR researchers and extension personnel, field representative and consultants.
2) Farming inputs would be needed.

Table 56. (Continued) Components of a Sub-subsystem to Grow Quality Cherry

<u>Continuity</u>

1) Farmers have to sell their product in order to stay in business.
2) Kona farmers are proud of their cherry's high quality and take extra care to maintain it.

Table 57. Components of a Sub-subsystem to Secure Quality Cherry

---

Objective, Purpose, Mission, or Desired Final State

To secure top-quality cherry for processing. Outputs would include top quality cherry delivered to processors and equitable farmer payment for it.

Measure of Performance

The amount of green coffee produced that can be sold.

Subcomponents

1) Delivering best beans,
2) Determining quality, and
3) Providing rewards for high quality.

Interaction (Information Flow)

Feedback, in the form of technical information, fair cherry grades and payments would be passed from processors to farmers.

Exists in Wider Systems

1) Farmers harvest other crops at the same time as coffee.
2) Processor payment to farmers depends on economic factors outside uttering outside Kona.

Decisions/Authority

1) Farmers would decide when to pick cherry.
2) Pickers would decide which cherry to pick.
3) Farmers would decide when and how cherry is delivered to processors.
4) Processors would determine cherry quality.

Resources

1) Human resources would include: farmers, farm families, hired pickers, cherry quality "eyeballers", and processors.
2) Mechanical harvesters could be used if field topography permitted.

Continuity

Only quality cherry can be used to produce quality coffee.

Table 58. Components of a Sub-subsystem to Transfer and Store Quality Cherry/Coffee

---

Objective, Purpose, Mission, or Desired Final State

To move, store and distribute cherry and coffee. Cherry would be delivered to processing mills on time. Less back-breaking effort would result from improved methods. Properly stored, high quality green coffee would reach the market.

Measure of Performance

1) Non-fermented cherry is delivered to processors.
2) Fresh green coffee is delivered to coffee buyers.

Subcomponents

1) Transporting cherry,
2) Storing coffee properly, and
3) Distributing coffee.

Interaction (Information Flow)

1) Farmers would be apprised of schedules for picking up cherry.
2) Information about how to store coffee would be obtained from a system to provide information and technology pertinent to Kona's agricultural needs.
3) Information about coffee distribution schedules would be transmitted from the sub-subsystem designed to "even-out" supply.

Exists in Wider Systems

1) Transportation channels move other commodities as well as coffee.
2) Processors store other commodities in their storage facilities.

Decisions/Authority

1) Farmers would decide when to deliver cherry to drop off points and processors would schedule cherry pick-ups.
2) Processors would make decisions regarding storing, distributing and milling green coffee.
3) If a marketing order were enacted, some green coffee supply and grading decisions would be made by a marketing order committee.

Resources

1) Human resources (actors) would include: farmers, processors, truck drivers, and loading crews.
2) Coffee bags or bins would be used to transport cherry and coffee.
3) Trucks would be needed to transport cherry/coffee.
4) Scales would be needed to weigh cherry/coffee.
5) Warehouses with low humidity and moderate temperature would be needed to store parchment and green coffee.

Table 58. (Continued) Components of a Sub-subsystem to Transport and Store Cherry/Coffee

Continuity

1) Cherry must be transported in a timely manner from farmers fields.
2) Coffee must be transported to where it can be sold.

Table 59. Components of a Sub-subsystem to Evaluate Parchment and Coffee

Objective, Purpose, Mission, or Desired Final State

To produce high quality parchment and green coffee, which are precursor products of roasted coffee. Parchment would be low in moisture before it is milled to green. Specific biochemical characteristics of Kona coffee would be identified.

Measure of Performance

1) Amount of dry, millable parchment received.
2) Amount of green coffee containing specific biochemical components.

Subcomponents

1) Determining when parchment is ready for milling and
2) Setting standards for Kona coffee

Interaction (Information Flow)

1) Processors would provide feedback to parchers about the quality of parchment received.
2) Information about Kona coffee characteristics would be incorporated into product marketing campaigns.
3) If agronomic practices could be linked to enhancing identified biochemical components influencing Kona coffee taste, information about the practices would be communicated to farmers.

Exists in Wider Systems

Coffee buyers have their own means of evaluating coffee taste.

Decisions/Authority

1) Processors would decide whether to buy sun or machine dried parchment.
2) Parchers would determine when parchment is of low enough moisture to deliver to the mill. Processors would accept or reject dried parchment.
3) People pursuing industry-wide concerns would make decisions about utilizing information about biochemical components influencing Kona coffee taste.

Resources

1) Human resources would include: parchers, processors, and UHMCTAHR researchers or private consultants undertaking biochemical analyses.
2) Improved parchment procedures would be needed for determining the moisture content of parchment.
3) Funding to undertake biochemical analyses would be needed.

Table 59. (Continued) Components of a Sub-subsystem to Evaluate Parchment and Coffee

<u>Continuity</u> High quality parchment and green coffee are necessary for producing high quality coffee.

Table 60. Components of a Sub-subsystem to Process, Roast and Brew Coffee

Objective, Purpose, Mission, or Desired Final State
To correctly process, roast, and brew high quality coffee that would satisfy consumers.

Measure of Performance
Sales of Kona coffee.

Subcomponents
1) Processing
   a) Pulping beans,
   b) Fermenting beans, and
   c) Drying parchment,
2) Roasting at proper temperatures, and
3) Brewing coffee in correct sized urns.

Interaction (Information Flow)
Information on how to improve processing, roasting and brewing procedures would be provided by KCC, outside sources such as UHMCTAHR and private consultants.

Exists in Wider Systems
Subgroup participants debated whether these sub-components belong in the improved system since they had little information about or influence on these activities. Participants stated that these activities were undertaken by wider systems about which they had limited information. They were included because several participants insisted that they were absolutely necessary for producing quality coffee.

Decisions/Authority
Participants stated that they had little power to alter these activities because decisions would be made by private businesses. They could, however, suggest improvements.
1) Processors would decide how cherry was processed,
2) Roasters would decide how to roast green coffee, and
3) Food outlets and consumers would decide how to brew coffee.

Resources
1) Human resources would include: processors, roasters, and brewers.
2) Machines for processing, roasting and brewing would be needed.

Continuity
Coffee cherry must be processed, roasted, and brewed before it can be drank.

Table 61. Components of a Sub-subsystem to Even-out Coffee Supply

Objective, Purpose, Mission, or Desired Final State

To produce cherry evenly among production years and to release the correct amount of green and roasted coffee to stabilize and increase price. A stable supply of high quality coffee would result.

Measure of Performance

Amount of over/under supply occurring in the market.

Subcomponents

1) Evenly producing coffee and
2) Releasing correct amount of coffee for sale

Interaction (Information Flow)

1) Information pertaining to the necessity of and how to undertake agronomic production practices for evening-out supply would be provided to the "growing quality cherry" sub-subsystem from UHMCTAHR and other sources.
2) Information about the level of coffee production would be fed into the "transferring and storing" sub-subsystem in order to efficiently move the product.
3) Information about supply and price would flow to the system designed to "pursue industry-wide concerns", if a marketing order were enacted.

Exists in Wider Systems

1) Kona's weather affects coffee flowering, which determines how much cherry is available for processing.
2) Supplies of other gourmet coffees affect demand for Kona coffee.

Decisions/Authority

1) Farmers would decide to use improved agronomic practices that control the amount of cherry produced.
2) Processors would decide how and when to ship and sell coffee.
3) If a marketing order were passed, the marketing order committee would decide on the amount of Kona coffee that could be shipped.

Resources

Human resources (actors) would include: UHMCTAHR researchers to develop coffee pruning, irrigation, flowering and hormones to alter coffee's natural bearing tendency.

Continuity

Market development and maintenance depends on a steady supply of product.

Table 62. Components of a Sub-subsystem to Pursue Industry-wide Concerns

Objective, Purpose, Mission, or Desired Final State

To maintain Kona coffee's reputation and market share by members of the industry working together. Industry-wide decisions would result. Resources would be collected. Favorable state legislation would prescribe blend label standards.

Measure of Performance

If KCC's agenda for controlling "counterfeiting" and blending of Kona coffee were carried out.

Subcomponents

1) Working together (industry unification) and
2) Defining blend labelling

Interaction (Information Flow)

1) Decisions resulting from this sub-subsystem would provide information (e.g. how much green coffee to release for sale, types of advertising campaigns to develop, new cherry bag sizes, etc.) that direct other sub-subsystems.
2) Funds generated would be channelled to other systems for marketing and research.

Exists in Wider Systems

1) Other industries are important in Kona.
2) Kona coffee is blended with coffees from other places.

Decisions/Authority

1) The federal government would collect an assessment on each pound of cherry delivered to mills if a marketing order were approved.
2) If a marketing order were passed, the marketing order committee would decide on:
    a) the amount of Kona coffee that could be shipped and
    b) the amount of funds channelled to research and marketing activities.

Resources

1) Human resources would include all members of the Kona coffee industry.
2) Legal advice on labelling issues would be needed.
3) A marketing order would be one means of bring the industry together.

Continuity

Kona coffee is just one of many fine gourmet coffee. Working together as an industry is imperative for continued sales.

Table 63. Components of a Sub-subsystem to Develop Products and Market Campaigns

---

Objective, Purpose, Mission, or Desired Final State

To sell as much Kona coffee as possible at a price that made growing, processing and selling coffee profitable. Outputs would include a market plan consisting of identified nitches for Kona coffee, advertisements and promotional events. New products, markets and increased demand for Kona coffee would result.

Measure of Performance

Sales.

Subcomponents

1) Deciding on nitches for Kona coffee and
2) Undertaking promotional activities

Interaction (Information Flow)

1) The amount of Kona coffee sold would determine the amount of cherry which could be absorbed.
2) The results of the UHMCTAHR study would be passed on to the "pursuing industry-wide concerns" sub-subsystem.
3) Information about Kona coffee's superior quality would be conveyed to consumers.
4) Market information would be transferred throughout the system.

Exists in Wider Systems

1) Other systems sell other gourmet coffees.
2) A UHMCTAHR marketing study was under way examining the potential of the Kona coffee industry.

Decisions/Authority

1) The industry (KCC, processors and roasters) would determine which avenues to pursue for marketing Kona coffee; including the selection and hiring of an advertising agency.
2) If a marketing order were enacted, the decision of how large a promotional budget and marketing activities would be made by a marketing order committee.

Resources

1) Human resources would include advertisers and promoters.
2) Market information would be provided by the UHMCTAHR study.
3) Funding would come from the marketing order, state programs, and private businesses.

Continuity

Kona coffee is just one of many fine gourmet coffee. Marketing activities are needed to maintain Kona coffee's market share.

APPENDIX E

COMPARING A MODEL OF A SYSTEM TO MAINTAIN THE QUALITY OF AND MARKET KONA COFFEE WITH THE PRESENT SITUATION AND DEBATING FEASIBLE AND DESIRABLE CHANGES

During Stage Five, fifty-seven percent of the original KFC farmers and seventy-nine percent of the original TT group compared the current situation with activities embodied in the model to maintain the quality of and market Kona coffee. Proposals for change resultant from the comparison were debated for their organizational, cultural, technical and economic desirability and feasibility during Stage Six. Participants who did not raise coffee were not included in the debate.

The analyst used the question generation technique described in Chapters III and IV for developing charts for stimulating discussion (Table 64). Table 65 presents participant responses for nineteen proposals for change to maintain the quality of and market Kona coffee. Tables 66–100 present participant statements recorded by the analyst's mind maps concerning the desirability and feasibility of the proposals for change.

Table 64. Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

<u>Stage Four Model Subsystem Activity</u>
Growing quality cherry

<u>Present Existence of Activity</u>
Yes, but room for improvement

<u>Present Mechanism by Which Activity Exists</u>
1) Uses 1950's information and technology
2) Some recent UHMCTAHR research, and
3) A few people use KCC's library

<u>Present Activity's Measure of Performance</u>
Grade received with delivered to KFC or acceptance/rejection by other processors

<u>Proposed Activity Change</u>
Proposal Thirteen:
UHMCTAHR to develop and distribute to farmers updated information and technology.

Proposal Fourteen:
Elected officials work to ensure agricultural land and water availability.

Proposal Fifteen:
Processors to step up farmer feedback about grading outcomes and to provide technical assistance.

<u>Comments Relating to Current and Proposed Activities</u>
1) Information and technology to be supplied from a system to provide information and technology pertinent to Kona's agricultural needs.
2) Economics should reward use of information and technology.
3) Urban pressures make economics of farming difficult.
4) Grading feedback currently limited to specific processors.
5) Assistance should be provided via extension service and field representatives.

Table 64. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

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Stage Four Model Subsystem Activity
Securing quality cherry

Present Existence of Activity
Yes

Present Mechanism by Which Activity Exists
1) Selective hand harvesting and
2) Grading is by "eyeballing" (visual inspection when delivered to the mill)

Present Activity's Measure of Performance
Percent saleable coffee

Proposed Activity Changes
Proposal Sixteen:
UHMCTAHR to produce new brochure about how to deliver best beans (picking, sorting, and bagging).

Proposal Seventeen:
Processors to:
1) sort cherry when received and pay accordingly,
2) keep poor from good cherry, and/or
3) separate cherry by variety.
OR
Proposal Eighteen:
Processors to:
1) tighten up on "eyeballing" procedure,
2) use an independent third party grader, and
3) explain to farmers how grades are determined.
AND/OR
Proposal Nineteen:
Processors to sort and grade samples from each delivery.

Comments Relating to Current and Proposed Activities
1) Information and technology to be supplied from a system to provide information and technology pertinent to Kona's agricultural needs.
2) Economics should reward use of information and technology.
3) Funding is required to buy sorter, make centralized cherry drop-off point and develop more processing lines.
4) Currently no mechanism exists to keep poor from high quality cherry.
5) Caturra may be an variety inferior to Guatemalan.
6) KFC once employed an independent third party grader.

Table 64. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

<u>Stage Four Model Subsystem Activity</u>
Transferring and storing cherry/coffee

<u>Present Existence of Activity</u>
Somewhat

<u>Present Mechanism by Which Activity Exists</u>
1) Farmers fill 100 pound bags, load jeeps and trucks, and drop off at pick-up points or the mill and
2) Processors pick up, store and ship coffee

<u>Present Activity's Measure of Performance</u>
1) Cherry can be loaded onto jeeps,
2) Cherry arrives at mill in a timely manner, and
3) Coffee arrives where and when it is desired.

<u>Proposed Activity Changes</u>
Proposal Twenty:
1) Processors to provide smaller bags or larger bins
AND/OR
2) Farmers to pay pickers by the pound.

Proposal Twenty-one:
Farm organizations to investigate building a bonded warehouse with controlled atmosphere.

Proposal Twenty-two:
UHMCTAHR to investigate the affects of storage.

Proposal Twenty-three
The State to have Mainland distribution centers to help move Hawaiian products.

<u>Comments Relating to Current and Proposed Activities</u>
1) One hundred pound bags may be too heavy.
2) If smaller bags or larger bins are used, the picking price should be adjusted accordingly.
3) Storage capacity is limited to individual processor facilities
4) Financial resources limit construction of additional storage facilities.
5) Banks are concerned that processors' inventories are not nailed down.
6) Information on affects of storing and aging coffee is needed.

Table 64. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

Stage Four Model Subsystem Activities
1) Evaluating parchment and
2) Evaluating coffee

Present Existence of Activity
1) Yes, but room for improvement

Present Mechanism by Which Activity Exists
1) Procedure for evaluating parchment varies by processor ("eyeballing" is common) and
2) Samples of coffee are cupped

Present Activity's Measure of Performance
1) Processor accepts parchment,
2) Price reflects cuppers' evaluation, and
3) Sales

Proposed Activity Changes

Proposal Twenty-four:
Parchers to use verifiable procedures, e.g. moisture meters.

Proposal Twenty-five:
UHMCTAHR or private consultant to determine character (chemical components) of Kona Coffee.

Comments Relating to Current and Proposed Activities
1) Currently parchment is checked after purchased.
2) Coffee quality is subjective.
3) Measures are needed to identify and characterize Kona coffee biochemically.
4) Chemical analysis is terribly expensive.

Table 64. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

<u>Stage Four Model Subsystem Activities</u>

1) Processing coffee correctly,
2) Roasting coffee correctly, and
3) Brewing coffee correctly.

<u>Present Existence of Activity</u>

Yes

<u>Present Mechanism by Which Activity Exists</u>

Techniques vary

<u>Present Activity's Measure of Performance</u>

Sales

<u>Proposed Activity Changes</u>

Proposal Twenty-six:

UHMCTAHR and KCC to provide encouragement and information on how to improve procedures.

<u>Comments Relating to Current and Proposed Activities</u>

1) Information is lacking about how to improve activities.
2) Improvement depends on individual's willingness to adopt new techniques.

Table 64. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

<u>Stage Four Model Subsystem Activities</u>
Evening-out supply

<u>Present Existence of Activity</u>
1) No means to control amount of cherry produced and
2) Processors have some storage space

<u>Present Mechanism by Which Activity Exists</u>
1) Farmers are at the mercy of the weather and
2) Individual processors supply storage

<u>Present Activity's Measure of Performance</u>
Amount of over/under supply occurring

<u>Proposed Activity Changes</u>
Proposal Twenty-seven:
UHMCTAHR to investigate how to "evenly" produce coffee.

Proposal Twenty-eight:
Storage facilities are needed. See Proposal Twenty-one.

<u>Comments Relating to Current and Proposed Activities</u>
1) Supply varies among and within years.
2) Hawaii's climate is too humid for proper storage.

Table 64. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

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Stage Four Model Subsystem Activities

Pursuing industry-wide concerns

Present Existence of Activity

Yes, but limited

Present Mechanism by Which Activity Exists

1) KCC is trying to bring the industry together and
2) KCC and private businesses review laws and lobby

Present Activity's Measure of Performance

1) KCC agenda items that are carried out and
2) KCC's legislative agenda is approved

Proposed Activity Changes

Proposal Twenty-nine:
Members of the industry to work together, including approving a marketing order.

Proposal Thirty:
Farm organizations to pursue favorable administrative laws, especially related to blend labelling to:

a) set a minimum amount of Kona coffee in blends

OR

b) reveal how much Kona coffee and/or origins of other coffees in Kona blends

OR

c) have no blend laws.

Comments Relating to Current and Proposed Activities

1) KCC funds limited as only four processors participate in KCC.
2) Farmers don't understand marketing orders.
3) It may be difficult to get buyers to agree to blend legislation as they want flexibility to mix blends freely at any time.
4) Currently there aren't set blend regulations.
5) A new federal law will require that origins of other coffees be displayed on blend packages.
6) Enforcing blend regulations may be problematic.

Table 64. (Continued) Conceptual Model Activities Compared With Present Situation and Proposals of Change For a System to Maintain the Quality of and Market Kona Coffee

Stage Four Model Subsystem Activities
Developing product and market campaigns

Present Existence of Activity
Yes, but limited

Present Mechanism by Which Activity Exists
Private companies develop products and advertise under brand names

Present Activity's Measure of Performance
Sales

Proposed Activity Changes
Proposal Thirty-one:
Advertising to be undertaken by:
a) private brand names
AND/OR
b) industry-wide generic advertising.

Comments Relating to Current and Proposed Activities
1) A UHMCTAHR marketing study is underway.
2) Based on it, the industry can decide marketing strategies.

Table 65. Percent of KFC Farmer and TT Group Participants Verbally Favoring and Not Favoring Proposals Thirteen through Thirty-one

Proposal Number	Percent of KFC Farmers Verbally Favoring	Percent of KFC Farmers Verbally Not Favoring	Percent of TT Group Verbally Favoring	Percent of TT Group Verbally Not Favoring
13	60	0	53	3
14	44	8	47	3
15	60	4	26	18
16	32	8	37	16
17	24	18	26	24
18	44	16	37	11
19	8	20	26	13
20	36	44	37	37
21	14	46	26	32
22	54	6	39	16
23	0	48	5	63
24	40	20	32	0
25	40	40	45	21
26	20	0	16	0
27	36	36	66	5
28	8	0	3	3
29	64	12	42	13
30a	36		26	
30b	58		55	
30c	8		11	
31a	28		42	
31b	52		58	

A. Proposal Thirteen

Tables 66 and 67 present participant comments recorded by the analyst pertaining to the proposal that UHMCTAHR should develop and distribute updated coffee production information. Sixty percent of the KFC farmers and 53% of the TT group verbally favored the proposal. Only one TT group participant had reservations about UHMCTAHR being the best entity develop information.

Table 66. KFC Farmer Statements About Proposal Thirteen that UHMCTAHR Should Develop and Distribute Updated Coffee Production Information

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Organizationally Desirable

1) It's a good thing to have more UH research projects in Kona.
2) The extension service should concentrate on tree crops, not assisting housewives.

Culturally Desirable

1) Ideas change by looking at the big picture.
2) Way back, UH used to get farmers together and explain good and bad (practices).
3) All farmers want booklets. UH (needs to) follow through and ask farmers what they want (e.g. a study to find out how much fertilizer to use).

Technically Feasible

1) (When to apply and what kind of) fertilizer information is needed.
2) Soil and leaf analyses are needed for growing quality cherry.
3) There hasn't been any information (research) developed.
4) That would be good for guys not versed (in growing coffee) but have a lot of coffee land and want to get into it.

Economically Feasible

1) A grower's brochure would be cheap and easy.

Table 67. TT Group Statements About Proposal Thirteen That UHMCTAHR Should Develop and Distribute Updated Coffee Production Information

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Organizationally Desirable

1) If UH has got the information, they should dispense.
2) I don't know if UH is in a good position. Technology exists in the world. It is best to have someone (e.g. farmers, business, etc.) go down there (Latin America) and ask the right questions.
3) Some people use what they have always done. Others are utilizing the KCC library, observing other coffee areas, or inventing their own technology.

Culturally Desirable

1) The UH technicians need to go to Kona; not just serve one group.
2) There is a need for communication about growing quality coffee.

Technically Feasible

1) Testing on-farm is also needed.
2) They've (UH's) got the information. They need to get it out.
3) There's a dispute. Focus is not on quality but quantity.
4) This year production is small but (has) real good quality.
5) Every couple of years, they have to update (information).
6) Who wants 1950's information?
7) Some people use 1950's information because it's most appropriate for their situation.

Economically Feasible

There were no comments pertaining to economic feasibility.

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2. Proposal Fourteen

Participant responses to the proposal that elected officials should work to insure agricultural land and water availability are presented in Tables 68 and 69. Forty-four percent of the KFC farmers favored the proposal. Two KFC farmers did not favor the proposal because they stated that there was no need for irrigation water. Forty-seven percent of the TT group participants favored the proposal. One TT group participant had reservations whether land reform was actually feasible.

3. Proposal Fifteen

This proposal was discussed by several participants in conjunction with Proposals Seventeen, Eighteen and Nineteen.

4. Proposal Sixteen

Participant responses to the proposal that UHMCTAHR prepare a new brochure about how to deliver the "best" beans are presented in Tables 70 and 71. Thirty-two percent of the KFC farmers favored the proposal; some stated that older farmers knew how to pick and deliver the best beans but that newer farmers could use the information. Eight percent of the KFC farmers felt new information wasn't necessary. Thirty-seven percent of the TT group favored the proposal. Sixteen percent of the TT group opposed it stating that the old brochure was adequate. Sixteen percent of the TT group questioned if UHMCTAHR had more expertise than farmers and if losses were actually caused by poor delivery practices.

Table 68. KFC Farmer Statements About Proposal Fourteen that Elected Officials Should Work to Insure Agricultural Land and Water Availability

Organizationally Desirable

1) One has to use a lot of irrigation water to qualify (for agricultural water rates) with the Board of Water Supply.

Culturally Desirable

1) The cost of land and water is a big problem.
2) So far, I'm not concerned because I have deep soil and don't think I need irrigation.
3) I've supported politicians to keep long term leases.

Technically Feasible

1) Farmers need cheaper rates and to find more water wells because there's going to be a lack of it (water).
2) There isn't much water for irrigation.

Economically Feasible

1) If one irrigates, there no tax cut. It's going to cost.
2) Farmers could use agricultural water rates.
3) It doesn't pay to irrigate.

Table 69. TT Group Statements About Proposal Fourteen that Elected Officials Should Work to Insure Agricultural Land and Water Availability

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Organizationally Desirable

1) That's who (elected officials) should do that (work for land and water availability).
2) It should not be UH.
3) Most other places give farmers breaks with water rates.
4) KCC and Hawaii Farm Bureau could assist.

Culturally Desirable

1) Culturally people hold on too long.
2) There are also tourist, rich, traditionalist, and county-culture pressures that make economics of farming difficult.
3) Land reform is desirable but the legal system makes it less feasible - look at Oahu.

Technically Feasible

1) At this point the industry can't increase its sophistication and is not centralized.

Economically Feasible

1) It's (Irrigation's) expensive.
2) I can't tell the costs and benefits. Those with irrigation had better crops.

Table 70. KFC Farmer Statements About Proposal Sixteen That UHMCTAHR Should Prepare a New Brochure About How to Deliver the Best Beans

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Organizationally Desirable

There were no comments pertaining to organizational desirability.

Culturally Desirable

1) Old timers have experience. The new people need it.

Technically Feasible

1) Variation (in quality) is (caused by) picking.
2) It's a good idea but how do we control private guys?
3) There's (Pickings) no problem; grading is the biggest problem.

Economically Feasible

1) A cheap and easy growers brochure is needed.

Table 71. TT Group Statements About Proposal Sixteen That UHMCTAHR Should Prepare a New Brochure About How to Deliver the Best Beans

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Organizationally Desirable

1) This information can be found in newsletters.
2) A brochure should be (produced from) a UH and processor joint project.

Culturally Desirable

1) The old brochure is adequate.
2) A small, to-the-point thing (brochure) can't hurt.

Technically Feasible

1) Processors should do it. It's a market thing.
2) There should be research into bean quality.
3) There's a need to find an economical way for individual farmers to hold cherries.
4) Greens and raisins are controlled by picking.
5) (There's) No doubt that use of plastic bags and shaded storage might improve quality immediately. Do processors records show a decrease in quality, if so, why? Are we satisfied that recommendations for picking are inadequate?

Economically Feasible

There were no comments about economic feasibility.

5. Proposals Fifteen, Seventeen, Eighteen, and Nineteen

Tables 72 and 73 present participant comments about proposals that dealt with how coffee processors could encourage farmers to better grow and secure quality cherry. Proposal Fifteen suggested that processors step up feedback to farmers about grading outcomes and suggest technical assistance for improving activities affecting growing, picking and delivering cherry. Sixty percent of the KFC farmers and twenty-six percent of the TT group favored Proposal Fifteen. Four percent of the KFC farmers and fifteen percent of the TT group did not favor this proposal because they felt that it was not cost effective.

Proposal Seventeen proposed that processors sort cherry when received (requiring the purchase of color sorters), keep the poor cherry from top-quality cherry and separate cherry by variety. Twenty-four percent of the KFC farmers spoke in favor of using sorters. Eighteen percent of the KFC farmers did not favor the proposal because purchasing a sorter would be expensive. One KFC and one TT participant stated that the idea was good but questioned its economic feasibility. Twenty six percent of the TT group favored the idea and twenty-four percent did not because of cost of the sorter.

Proposal Eighteen suggested that the "eyeballing" procedure be tightened by using an independent third party grader and by explaining to farmers how grades were determined. Forty-four percent of the KFC farmers and thirty-seven percent TT group favored "eyeballing". Sixteen percent of the KFC and eleven percent of TT group participants questioned its accuracy.

Table 72. KFC Farmer Statements About Proposals Fifteen, Seventeen, Eighteen and Nineteen Regarding How Best To Grade Cherry

Organizationally Desirable

1) Testing (sampling) takes labor which holds down the company.
2) There's a need to follow up with farmers.
3) Processors must educate farmers.
4) Most processors aren't grading at all.
5) If there was somehow to get industry-wide sorting with a centralized staff and sorting machines, it would be a good idea.
6) KFC is only a marketing channel which doesn't actually purchase the product.

Culturally Desirable

1) There have been unfavorable comments about "eyeballing".
2) Some farmers don't agree with "eyeballing".
3) To determine if processors are consistent, they must work with farmers.
4) Processors should look at farmers' records.
5) (It would be good), if you can get enough farmers together to purchase a sorting machine, however, Kona's charm is its individual farmers.
6) At one time, an independent third party graded the cherry.
7) It's most critical to give farmers feedback and most difficult to enforce good production practices.
8) "Eyeballing" is baloney.

Technically Feasible

1) Testing (samples) is fair but only one grade is given per bag, therefore, an average must be taken.
2) If cherry is not of top grade, then take a sample.
3) Sorters (machines) are currently slow.
4) Sorting is too slow.
5) If they put samples through a sorting machine, then they could check for pesticide use and penalize farmers.
6) Color sorters are fast in Papua New Guinea.
7) Who's doing the grading? Accuracy depends on the distance of the "eyeballing" and at night it ("eyeballing") may be especially bad. KFC needs good eyeballs.
8) There's a need to determine what is an "acceptable" level of saleable coffee and processors should not buy anything below that.
9) There's no need to process Caturra (another variety) and poor cherry separately.
10) The eye can fool. More time and a qualified person who knows about cherry as the grader is needed.
11) The grader is an old guy.

Table 72. (Continued) KFC Farmer Statements About Proposals Fifteen, Seventeen, Eighteen and Nineteen Regarding How Best To Grade Cherry

Technically Feasible (Continued)

12) Pulling samples is more accurate than "eyeballing".

13) They need to get somebody else than KFC's workman to do the "eyeballing".

14) Farmers are getting ripped off by "eyeball" grading. I did a survey and took in two bags that were picked identically. One got a 93% and the other only 80% grade.

Economically Feasible

1) Physical sampling requires a minimum of ten people.

2) It's too costly to hire samplers.

3) "Eyeballing" is most economically feasible.

4) Making new product lines for inferior coffee is not feasible.

5) Who's footing the bill to buy sorters?

6) Why spend a lot of money on sorting machines?

7) How economical is sorting small batches?

8) Mechanical sorters are not economical now. When it reaches a point (that they are needed) to market the product, there will be no other alternative.

Table 73. TT Group Statements About Proposals Fifteen, Seventeen, Eighteen and Nineteen Regarding How Best To Grade Cherry

Organizationally Desirable

1) To buy a sorting machine is completely unworkable. The industry would never cooperate.
2) If (cherry is) sampled when brought in and the farmer is there, then questions could be answered.

Culturally Desirable

1) If we can get high tech sorting machines, then nobody can argue.
2) If you penalize, then you must sample.
3) Grading is a gimmick for reducing price and has no relation to the quality of the product.

Technically Feasible

1) "Eyeballing" is subjective.
2) "Eyeballing" should be done by looking at all the bags brought in, not just one.
3) KFC needs to train people as "eyeballers".
4) There's no need to sort cherry.
5) "Eyeballing" by one person who has experience could be more sophisticated and centralized.
6) What kind of sorter? Color, size, or gravity?
7) Separating cherry by variety is possible but might require two lines, staggered processing or specialized processors. Varieties have to be tested to demonstrate sufficient difference in size or cupping quality.

Economically Feasible

1) Change won't occur unless all processors grade. KFC is losing by grading.
2) Only "eyeballing" is economically feasible. Sorting machines cost too much. Only when it is cost efficient will machines or hand sorting be done.
3) This is (sorters are) not practical until the industry expands.
4) An independent third party is costly.
5) It's expensive to have somebody visiting farmers.
6) Sorting machines are ideal but costly.
7) Don't rely on the mills to grade. Collect fees for independent third party.
8) "Eyeballing" is the best (speedy and cost efficient) but open to criticism.
9) Color sorters are available. Processors could purchase them. This would increase quality and pay for itself to growers or processors.

Proposal Nineteen suggested sorting and grading samples from each delivery; a practice done by KFC in the past. Only eight percent of the KFC farmers favored sampling cherry. Twenty percent stated the practice was too costly. Twenty-six percent of the TT group stated it would be good to sample and eleven percent did not. One TT participant had reservations about the cost of sampling.

6. Proposal Twenty

Tables 74 and 75 present participant responses to the proposal that 1) processors should provide smaller bags or larger bins or 2) pickers should pick by the pound. Forty-four percent of the KFC farmers and twenty-one percent of the TT group favored staying with the 100 pound bags. Forty-seven percent of the KFC farmers and twenty-six percent of the TT group stated that changing to a smaller bag would be better. Sixteen percent of the KFC farmers and twenty-eight percent of the TT group strongly favored paying pickers by the pound rather than by the bag. Two TT group participants stated that changing bag size or payment for picking by the pound would require industry-wide agreement. Another questioned if every farm would be have a scale to weigh picked cherry. Four KFC farmers and two TT group participants questioned if pickers would like to change to smaller bags. Some felt that changing bag size might give pickers an excuse to raise their price. One TT group participant suggested using forty pound plastic grape harvesting bags.

7. Proposals Twenty-one and Twenty-eight

Proposals twenty-one and twenty-eight addressed (Tables 76 and 77) the need to store coffee so that it could be easily transferred and

Table 74. KFC Farmer Statements About Proposal Twenty Regarding Picking Container Size and Payment

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Organizationally Desirable

There were no comments related to organizational desirability.

Culturally Desirable

1) A smaller (bag) size would be better but it might be a problem with hired pickers.
2) One hundred pounds is not big.
3) Fifty pound bags are good for older Filipino pickers and myself. The trouble is that it takes two people to load the bags.
4) One can fill up a 100 pound bag on the truck.
5) Paying (picking) by the pound is fair.
6) Pickers think paying by the pound is weird.

Technically Feasible

1) Small bins that fit into the back of pickup trucks would be good.
2) Three 100 pound bags of cherry equal one bag of parchment.
3) Paying (pickers) by the pound is ideal.
4) KFC would have to have a scale at the weigh stations. It's not feasible to move scales.

Economically Feasible

1) It's better to stick with 100 pound bags. KCC would have to set a new price if there's a change or the pickers would cut the farmers' throats.
2) It's hard to change pickers because they're used to having a set harvest fee. There's a psychological affect.
3) If we can get away from sewing bags by delivering (cherry differently), it would be good. Delivering in bulk (larger size) is good because it cuts wasted man-hours.
4) It would cost too much to weigh the cherry.
5) Bins would be more economical for larger farmers.

Table 75. TT Group Statements About Proposal Twenty Regarding Picking Container Size and Payment

Organizationally Desirable

1) Each farmer would need a scale and platform.

2) It would take all the industry together to change bag size. That will be when it becomes a big enough problem; say three back injuries per mill.

3) Farmers won't pay pickers by the pound until pickers unite.

Culturally Desirable

1) There should be container options.

2) Bag size is a tradition.

3) It's hard to switch and pay by the pound.

Technically Feasible

1) Size of the bag is arbitrary.

2) Perhaps 40 pound plastic bags would be good.

Economically Feasible

1) Maybe smaller bags would reduce insurance rates.

Table 76. KFC Farmer Statements About Proposals Twenty-one and Twenty-eight Regarding Storage Facilities for Kona Coffee

Organizationally Desirable

1) Leave storage to the processors.
2) KFC has storage.
3) Don't hold off paying farmers.

Culturally Desirable

1) A bonded warehouse would be good if it would help some growers age their coffee.
2) The problem would be to get farmers to buy the idea because they want their money now. If they did it (stored coffee), they'd (KFC would) have to withhold a percent of the payment due farmers.

Technically Feasible

1) Storage is important for managing businesses and maintaining buyers.
2) There's no problem with storage because we can market all the production.
3) Controlled atmosphere is very important.
4) It would be good to sell when the price is right.
5) The market is cyclical.

Economically Feasible

1) How expensive would storage be?
2) There's a need for an economic feasibility study.
3) Moisture is too expensive of a problem.
4) The government should provide funding to finance storage.
5) How to (Who would) pay carry over costs?
6) It may not be economical for insurance costs, etc.

Table 77. TT Group Statements About Proposals Twenty-one and Twenty-eight Regarding Storage Facilities for Kona Coffee

Organizationally Desirable

1) Non-coop processors are suggesting this for their own good.
2) Storage is a marketing order function that allows private industry to speculate on the crop.
3) Coffee brokers should be responsible (for storage).
4) It's a good idea if the processors can get together.
5) Bankers love the idea of a nailed down inventory. A warehouse could be for all crops.
6) Let the coop's, private processors, and KCC have (to handle) storage.
7) Farm organizations are not at the farmer level; rather the processor level.

Culturally Desirable

There were no statements pertaining to cultural desirability.

Technically Feasible

1) Storage isn't a big problem.
2) Kona coffee doesn't keep well. It loses color.
3) There should be controlled atmosphere.
4) Controlled atmosphere may not be feasible.
5) Go and see how it's done in Jamaica.

Economically Feasible

1) It would stabilize price.
2) The cost of the warehouse should be paid by the processors.
3) Who pays for it?
4) Who will carry the inventory?
5) Storage might not be economically feasible. There would need to be a big credit union.

marketed. Proposal twenty-one suggested that a bonded warehouse with controlled atmosphere be investigated by community farm organizations (e.g. the Farm Bureau at its new marshalling yard). Forty-four percent of the KFC farmers did not favor the proposal for a bonded warehouse. Thirty-six percent of them questioned who would pay for it. Eight percent of the KFC farmers did not favor storing coffee because farmers did not want to wait for their payments. Only fourteen percent KFC farmers favored the proposal. One farmer questioned its economic benefits. Twenty-six percent of the TT group favored the proposal and thirty-two percent did not. Sixteen percent of the TT group stated that processors should pay for building storage facilities. One TT group participant stated that it was a good idea, but questioned its economic feasibility.

8. Proposal Twenty-two

Participant responses to the proposal that UHMCTAHR investigate the affects storing coffee are presented in Tables 78 and 79. Fifty-four percent of the KFC farmers favored the proposal. One farmer questioned the cost of the investigation and another did not give a reason for not favoring the idea. Thirty-nine percent of the TT group favored the proposal and sixteen percent did not. Sixteen percent of the TT group mentioned that such information was probably already available in coffee literature. One TT group participant stated that the idea merited low priority. One TT group participant did not care about affects of aging, however, supported an investigation to increase shelf life of coffee.

Table 78. KFC Farmer Statements About Proposal Twenty-two That UHMCTAHR Investigate the Affects of Storing Coffee

Organizationally Desirable
1) A UH specialist has to look into it. An individual can't do it.

Culturally Desirable
There were no statements pertaining to cultural desirability.

Technically Feasible
1) Green coffee may not deteriorate in storage.
2) Coffee will taste bad if kept too long.
3) Prime (coffee with small beans) coffee could be aged.
4) Aging (should be done) with parchment; not green.
5) Atmosphere control is very important.
6) Green coffee can be aged to take on subtle flavor, but it can also take on water.

Economically Feasible
1) It may cost too much.
2) Before UH gets into it, they should check if there's information from other countries.

Table 79. TT Group Statements About Proposal Twenty-two That UHMCTAHR Investigate the Affects of Storing Coffee

Organizationally Desirable
1) It would be easy as part of an on-going UH coffee quality project.
2) That's a low priority for UH work.

Culturally Feasible
There were no statements pertaining to cultural feasibility.

Technically Feasible
1) Storing parchment makes the taste milder.
2) The focus should be to extend shelf life.
3) It should be easy to pull out existing research (literature).
4) Coffee beans metabolize at higher temperature and humidity.

Economically Feasible
1) If the consumer liked aged coffee, then it (aging coffee) would be ok and it would raise the price.
2) Aging bad coffee makes it blander and less offensive.
3) There's no sense duplicating coffee buyers who store coffee - no sense in wasting money.

9. Proposal Twenty-three

Participant responses to Proposal Twenty-three are presented in Tables 80 and 81. None of the KFC farmers favored the proposal because they felt that it was not the State's responsibility for providing distribution centers. Forty-eight percent of the KFC farmers and sixty-three TT group participants disapproved of the proposal. Only one TT group participant favored the suggestion.

10. Proposal Twenty-four

This proposal suggested that farmers making parchment (parchers) should use verifiable procedures (e.g. moisture meters) (Tables 82 and 83). Forty percent of the KFC farmers and thirty-two percent of the TT group favored the idea. Two participants stated that parchers purposely wanted parch to be heavier because payment was based on a per pound basis. Twenty percent of the KFC farmers stated that eyeballing parch was an adequate means to determine moisture content.

11. Proposal Twenty-five

Responses to a proposal that UHMCTAHR or a private consultant determine the characteristics (chemical components) of Kona coffee because coffee quality was subjectively judged can be found in Tables 84 and 85. Forty percent of the KFC farmers favored the proposal and forty percent did not. Twelve percent questioned if the process would cost too much. Twelve percent stated that climatic and soil conditions affected taste. Forty-five percent of the TT group favored the idea and twenty-one percent did not. One supported the idea but had reservations about its cost. One KFC farmer and one TT group

Table 80. KFC Farmer Statements About Proposal Twenty-three That the State Should Have Mainland Distribution Centers for Agricultural Commodities

Organizationally Desirable
1) There's not a great deal of confidence in the state running the operation efficiently.

Culturally Desirability
There were no statements regarding cultural desirability.

Technically Feasible
1) A Mainland distribution center will be inefficiently ran.
2) Shipping is a major problem. A group of freight forwarders should consolidate.
3) That would require too big of an operation. The coffee industry is very small.
4) A state distribution center won't work.

Economically Feasible
1) It would cost too much.

Table 81. TT Group Statements About Proposal Twenty-three That the State Should Have Mainland Distribution Centers for Agricultural Commodities

Organizationally Desirable
1) A bonded warehouse should not be in Hawaii but on the Mainland.
2) The State is not in the business of taking orders and is only helping to a limited extent.
3) It (Storage) would done better privately.
4) Caution about (should be exercised when) getting the state into the private sector.
5) Private industry can probably do a better job.
6) There's a private program that coffee should look into.

Culturally Desirable
There were no comments pertaining to cultural desirability.

Technically Feasible
1) It's feasible for the State to boost but not operate a distribution center.
2) One could argue both ways about State involvement.

Economically Feasible
There were no comments pertaining to economic feasibility.

Table 82. KFC Farmer Statements About Proposal Twenty-four That Parchers Should Use Verifiable Methods

Organizationally Desirable
1) In the past parchers could get away with higher moisture.

Culturally Desirable
1) Parchers are experienced people.
2) Parchers cheat and leave parch wet purposely.

Technically Feasible
1) Parch is not that critical.
2) One can tell (moisture percentage) by eyeballing.
3) There have been standards developed (moisture percentages).

Economically Feasible
1) Parch is sold by weight. If too wet, then it weighs a few pounds more and the parcher gets more money.
2) It will make the cost go up.

Table 83. TT Group Statements About Proposal Twenty-four That Parchers Should Use Verifiable Methods

Organizationally Desirable
1) It will happen only when parch sellers band together.
2) The processors grade, give feedback and base the price on quality.
3) The same parchers are shared by (all the) processors and this results in a loss of quality control.

Culturally Desirable
There were no comments pertaining to cultural desirability.

Technically Feasible
1) That way (using moisture meters) they are able to see the quality.
2) The biggest problem is that parch is too wet.
3) The technology is available.

Economically Feasible
1) A moisture meter would pay off. It would be good if a cheaper one ($50) could be found to do the job. Now they cost over $1200.

Table 84. KFC Farmer Statements About Proposal Twenty-five That Chemical Components of Kona Coffee Should Be Determined

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Organizationally Desirable

1) Professional tasters judge (quality).

Culturally Desirable

1) There should be established, written quality standards for Kona coffee.
2) It's (the proposal is) too academic.

Technically Feasible

1) It's the climate that makes Kona coffee good.
2) Quality is a perception. The environment (cloud cover, volcanic soil, fertilizers, pruning, good drainage) is important.
3) Fertilizing, pruning, and harvesting are all tied together.
4) It's (an) interesting (topic) to pursue, especially if it can be traced back to farming practices.
5) If they can analyze (coffee) chemically, how applicable is it (the analysis) to different regions (elevations).
6) There is a difference. Some coffee gives you the jitters. It's full of herbicide. Maybe there's a chemical secret that makes it (coffee) not bitter, but mellow.
7) It's (the proposal is) too far fetched.

Economically Feasible

1) Who pays for the researcher and how much?
2) UH should try a few samples to determine the cost factor.
3) It's too expensive. Who's footing the bill?

Table 85. TT Group Statements About Proposal Twenty-five That Chemical Components of Kona Coffee Should Be Determined

Organizationally Desirable

1) UH should not do it (the analysis); rather private labs.

Culturally Desirable

1) There has to be a way to define quality.
2) Is this (determining quality) really a problem?

Technically Feasible

1) It's not done anywhere else in the world.
2) In the long range, quality depends on geographic area. It's not practical unless people at that (different) elevation(s) have knowledge.
3) Quality is a state of mind. We need organization to pound in (Kona coffee's) mystique; like California wines.
4) We won't supplant the cuppers.
5) Why (do we) need the services of cuppers.

Economically Feasible

1) It (the analysis) would be nice to have. The more jive the better.
2) There's a cost factor. If it costs one million for a five million dollar industry, then "no".
3) If the money is there to keep the gourmet market, it should be looked at.
4) This might give an edge (to Kona) over the competition.
5) What would the benefits be?

participant felt that quality of Kona coffee was based on product perception; rather than actual biochemical attributes.

12. Proposal Twenty-six

Most participants nodded their approval of the suggestion that UHMCTAHR and KCC provide encouragement and information on how to improve these procedures. None of the participants opposed the proposal. Specific comments about these activities are presented in Table 86.

13. Proposal Twenty-seven

Tables 87 and 88 present responses to the proposal that UHMCTAHR investigate how to evenly produce coffee so that farmers could better control flowering and reduce annual cherry/coffee production fluctuation. Thirty-six percent of the KFC farmers favored the idea and thirty-six percent did not. Those that did not favor it stated that it was not feasible because coffee flowering was dependent on the weather. These farmers did not believe that irrigation could control flowering. Sixty-six percent of the TT group favored UHMCTAHR research to investigate coffee flowering. One TT group researcher questioned if coffee flowering could ever be controlled. Two other TT group participants questioned if the cost of the research would be exceed its benefit.

14. Proposal Twenty-eight

See discussion of this proposal with Proposal Twenty-two.

Table 86. KFC Farmer and TT Group Statements About Proposal Twenty-six That Processing, Roasting and Brewing Procedures Should Be Improved

1) Processing coffee correctly is most important.
2) Brewers must be educated to use small urns.
3) Younger drinkers want darker roasts. It's a trend.
4) That is why a consumer marketing program is important - to make people understand how to brew good coffee.
5) Numerous commercial groups have on-shelf equipment or entire systems.

Table 87. KFC Farmer Statements About Proposal Twenty-seven That UHMCTAHR Investigate How to Evenly Produce Coffee

Organizationally Desirable

1) If they (UHMCTAHR) can do it, it would help with the labor problem.

Culturally Desirable

1) Old farmers without irrigation won't be able to use (the technology).

Technically Feasible

1) UH has been trying (experimenting) as a long term program (five years).
2) Flowering control could kill quality.
3) Pruning is a good control.
4) The climate is important.
5) It's not possible. One has to talk to the weather.
6) There was research on flowering but no follow-up.
7) This year is the lowest production yet.
8) There's no problem. We get the same production each year.

Economically Feasible

1) Irrigation is too expensive.

Table 88. TT Group Statements About Proposal Twenty-seven That UHMCTAHR Investigate How to Evenly Produce Coffee

Organizationally Desirable

1) There's a lot of research. They're (UHMCTAHR's) working on it now.
2) UH is doing it. They should publish something.
3) There's a (UHMCTAHR) Bullock/Beaumont Station report stating that they were able to get (synchronized) flowering with gibberellic acid.

Culturally Desirable

There were no comments regarding cultural desirability.

Technically Feasible

1) This is one of the top three ways to control supply.
2) UH can't control the weather.
3) They (UHMCTAHR) may be dreaming if they think they can control flowering with irrigation.
4) There's a lot tied to nutrition, irrigation and flowering.
5) It can be done with drip irrigation and constant fertilization (more than 3-4 times per year).
6) There's a UH proposal for crop modeling.
7) There may be a limitation with the coffee plant.

Economically Feasible

1) (I) Can't say the cost is worth it.

15. Proposal Twenty-nine

This proposal sought to enhance the prospect of the industry working together by suggesting the approval of a marketing order. Sixty-four percent of the KFC farmers favored the idea and twelve percent had reservations about 1) who would control it, 2) if farmers could be organized to approve it, and 3) how much assessment would be charged. Several farmers agreed with the proposal in principle, however, requested additional information about marketing orders. Forty-two percent of the TT group favored the proposal. One participant did not and three had reservations about the marketing order's cost and how it would be controlled. Tables 89 and 90 present KFC and TT group statements pertaining to the proposal.

16. Proposal Thirty

When participants debated this proposal concerning blend labeling, three alternative viewpoints arose: a) those that advocated a defined minimum percent of Kona coffee to be in each package of coffee labelled "Kona Blend", b) those that wanted retailers to state what percent of the blend was Kona coffee and c) those that did not want any blend labelling. These proposals were not written up separately as Proposals Seventeen, Eighteen, or Nineteen because they did not emerge until after debate (Stage Six activities) had begun. Information to develop Proposals Seventeen, Eighteen, and Nineteen emerged during Stage Four activities.

Tables 91 and 92 present comments by thirty-six percent of the KFC farmers and twenty-six percent of the TT group favoring that a definite percent of Kona coffee should be mandatory in Kona blends. Tables 93

Table 89. KFC Farmer Statements About Proposal Twenty-nine For Approving a Marketing Order

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Organizationally Desirable

1) A marketing order might be good because it's a concerted effort. The ideals of a cooperative are brought back together. That should be weighed against the free enterprise system.
2) It is hard to organize farmers.
3) It (A marketing order) might provide control over hotshots, but it might add too many controls.
4) Could it be used against farmers? Who would control it? It would be good to have no more than "X" farmers and processors from one company.
5) It may not be desirable for small processors.
6) It's good because it involves every farmer.

Culturally Desirable

1) It sounds good, but we need more information.
2) There's a need for discipline in the industry.
3) It sounds fair to the growers.

Technically Feasible

1) We've got to use the funds for promotion.

Economically Feasible

1) It depends on how much the assessment is. Bookkeeping will be extra, too.

Table 90. TT Group Statements About Proposal Twenty-nine For Approving a Marketing Order

Organizationally Desirable

1) It will provide a stable industry organization.
2) Who spends the money being assessed and how?
3) Sometimes the government is needed to make the playing field level.
4) A marketing order won't work in Kona with the different power influences.

Culturally Desirable

1) Farmers don't like it. Even if it has benefits in the long run, they won't agree.
2) It's survival. There has to be promotion as volume picks up.

Technically Feasible

1) If farmers make policy, the government enforces it.
2) There's a need to regulate surplus coffee to keep the price high.

Economically Feasible

1) It's a good way to raise funds.
2) Because of the high overhead cost for administration, it might not be economically feasible.

Table 91. KFC Farmer Statements Favoring A Definite Minimum Percent of Kona Coffee to be in a Kona Blend

<u>Organizationally Desirable</u>

1) One major retailer does not use less than 20%. Jamaica uses no less than 20%.
2) A minimum % Kona (10%) is needed, especially with the new Hawaiian coffees.

<u>Culturally Desirable</u>

1) It's not fair to blend Kona coffee with other coffee.

<u>Technically Feasible</u>

1) Kona coffee is well known. There should be a guideline so that they (retailers) can not use only one bean. At least 10-25% (Kona coffee) should be in Kona coffee (blend).
2) There should be a dominance of Kona coffee in a blend - at least 50%, (in order) to call it a Kona blend.
3) I have reservations as to whether the roasters will agree.

<u>Economically Feasible</u>

1) Having a defined percent in a blend will mean using more Kona coffee.

Table 92. TT Group Statements Favoring A Definite Minimum Percent of Kona Coffee to be in a Kona Blend

Organizationally Desirable

There were no comments pertaining to organizational desirability.

Culturally Desirable

1) It would be nice to have a minimum because people don't read the label. There's false advertisement. They're (retailers are) playing with words.
2) It's the honest way. Then people buying coffee will know (what they're buying).

Technically Feasible

1) It should be 25% Kona coffee for institutional buyers and 50% for regular consumers.
2) A minimum should be set, maybe at 40%.
3) Common sense would mean more than 50%.
4) A minimum percent has a low possibility of passing.
5) A mix should have a constant taste: at least 5-10%.

Economically Feasible

There were no comments pertaining to economic feasibility.

and 94 present comments by those that favored stating how much of the blend (%) was Kona coffee on the label. Another suggestion was to state on the label the origin of other coffees with which Kona was blended. The analyst pursued this suggestion, however, little interest was expressed. Tables 95 and 96 present comments by those that favored no blend labelling laws.

17. Proposal Thirty-one

Two alternate means of advertising Kona coffee emerged and were debated. Twenty-eight percent of the KFC farmers and forty-two percent of the TT group stated that advertisement was the responsibility of private retailers (Tables 97 and 98). Fifty-two percent of the KFC farmers and fifty-eight percent of the TT group supported a generic "Kona" advertisement campaign (Tables 99 and 100). Eight percent of the KFC farmers and thirty-two percent of the TT group favored both private and generic advertising.

Table 93. KFC Farmer Statements Favoring Stating How Much Kona Coffee is in a Blend on the Package Label

<u>Organizationally Desirable</u>

1) It is excellent for the consumer to choose which blend is best.
2) One company has KFC under it's thumb. They should specify on the label how much Kona coffee is in their blend.

<u>Culturally Desirable</u>

1) I'm totally behind truth in labelling. It's essential for survival.

<u>Technically Feasible</u>

1) It's best to have a minimum percent but practically speaking, revealing the percent in the blend is most feasible.
2) Who's going to monitor it?
3) A label disclosing how much Kona coffee is in the product and what other coffees (regions named) are blended with it is at least a minimum.

<u>Economically Feasible</u>

There were no comments pertaining to economic feasibility.

Table 94. TT Group Statements Favoring Stating How Much Kona Coffee is in a Blend on the Package Label

<u>Organizationally Desirable</u>

1) It's possible if we can get the industry to work together.

<u>Culturally Desirable</u>

1) It's (This proposal's) a compromise: not too specific but no less than a stated amount.
2) Spelling out what's in there must be done.

<u>Technically Feasible</u>

1) It (This proposal) is straight forward and most feasible.
2) Roasters could state the blend has a minimum percent Kona. This would give flexibility without needing to change the can or package label.

<u>Economically Feasible</u>

1) We should not legislate ourselves out of the blend market.

Table 95. KFC Farmer Statements Favoring No Blend Labelling Laws

<u>Organizationally Desirable</u>

1) The consumer judges.

<u>Culturally Desirable</u>

There were no comments pertaining to cultural desirability.

<u>Technically Feasible</u>

1) (Present labelling is all right) as long as the quality is there. I don't know because I doubt if we can say how much (should be in a blend).

<u>Economically Feasible</u>

1) It's not going to get people to buy more by requiring the seller to label (how much is in a blend).

Table 96. TT Group Statements Favoring No Blend Labelling Laws

<u>Organizationally Desirable</u>

1) It will require an inspector to inspect backyard roasters. Enforcement won't work.
2) It's bad when the government steps in.
3) The retailers can't change their labels per batch.

<u>Culturally Desirable</u>

There were no comments pertaining to cultural desirability.

<u>Technically Feasible</u>

1) Does it ensure quality by mandating a percent when they may use "junk" Kona (coffee)?

<u>Economically Feasible</u>

1) Don't specify the amount of Kona coffee in the blend as long as the roasters sell more. It's a proprietary secret.
2) The market will determine blends.

Table 97. KFC Farmer Statements Favoring Private Advertising of Kona Coffee

Organizationally Desirable
1) That's the manager's job. If we hire from the outside, we have to pay.

Culturally Desirable
There were no comments pertaining to cultural desirability.

Technically Feasible
1) If there's generic advertisement, then it's possible to have bad coffee advertised.
2) Generic advertising makes no sense until Kona blends use more Kona coffee.

Economically Feasible
There were no comments pertaining to economic feasibility.

Table 98. TT Group Statements Favoring Private Advertising of Kona Coffee

Organizationally Desirable
1) Advertising should be by the processors, not the industry.

Culturally Desirable
There were no comments pertaining to cultural desirability.

Technically Feasible
1) How effective is generic advertising?
2) I don't perceive we're promoting a product, but an idea, a mystique. Private businesses can take advantage of this.
3) What can generic advertising do? There's an emphasis on the coffee festival. How much more can it grow?

Economically Feasible
1) Generic advertising is not worth the money.
2) Other than involve one company, the industry can't pull together for generic advertising. Individual processors who have already started their own advertising will stand to loose.

Table 99. KFC Farmers Statements Favoring Generic Advertising of Kona Coffee

Organizationally Desirable

1) Promotion shouldn't be for processors. KCC should do something.

Culturally Desirable

1) People don't hear about Kona.
2) In the long run it will help Kona coffee. Everybody should benefit by developing "hype".
3) We need to educate the public that there is a difference; that Kona coffee is better.
4) Generic is fair to everybody.

Technically Feasible

There were no comments pertaining to technical feasibility.

Economically Desirable

1) We have surplus coffee and need to look for a market.
2) Generic advertising is best. If we're all separate, we're going to go bankrupt.
3) There should be some generic advertising but we need the marketing order. I'm not sure it can be advertised any other way.

Table 100. TT Group Statements Favoring Generic Advertising of Kona Coffee

Organizationally Desirable

1) Generic advertisement should be on the Mainland. The industry should be one single (entity) overseas to sell everything as a whole.
2) Generic benefits the industry as a whole.

Culturally Desirable

There were no comments pertaining to cultural desirability.

Technically Feasible

1) Generic advertising will be important in three years when there's other Hawaiian coffees.
2) KCC's Seal of Approval is very important, especially for 100% pure Kona Coffee.
3) California has good advertisements.

Economically Feasible

1) Generic is good because we're all taxpayers.

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